

Designing Online Education for Work Based Learners: Refining Bite Sized Learning

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I certify that this thesis is the true and accurate version of the thesis approved by the examiners

Signed _____

Date _____

Declaration

I, Colin Gray, confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I can confirm that this has been indicated in the thesis.

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Abstract

Online learning is increasingly prevalent in education and one area which stands to benefit from this approach is work based learning. This area is characterised by time-poor students and a requirement for flexibility in time and location. Online learning could be considered a solution to these issues, providing greater flexibility than campus based offerings, but it is not a panacea. Online learning suffers from a range of issues, particularly in retention, generally seeing attrition rates between 10% and 20% higher than traditional education.

This research investigates an emerging method for delivering online education to work based learners and how it compares to traditional methods with respect to engagement. The method is named bite sized learning, and the core principle is that lessons are delivered in very short, bite sized chunks. These chunks are delivered on a daily basis, comprised of content, guidance and practical tasks. Each chunk also includes a requirement for social interaction with a learning peer group.

This work takes an action research approach, combined with grounded theory and mixed methods. The author proposes the use of a methodology "stack", utilising each of these approaches, which will be shown to enable rigorous evaluation and development of an emerging educational method. The mixed methods employed comprise learning analytics and qualitative course evaluation survey data.

To begin the work, a series of identical bite sized courses are quantitatively analysed in order to propose a reliable measure of engagement for bite sized learning. This concludes that a measure of daily participants produces the most effective results.

Using the methodology "stack," the body of this research takes a 3 stage practice-based approach. A set of live bite sized learning courses are studied, via the "stack", producing an evaluation, an experiment and a resulting theory for bite sized learning. The evaluation reveals current patterns of engagement within bite sized learning, and enables the development of an early theory. The results of this inform the development of an experiment, intended to test the effect of the daily format versus a simpler form of bite sized learning, delivering all content at the beginning. These experimental results, allied with further qualitative data, allow further development and refinement of a bite sized learning theory.

It is discovered that bite sized learning does offer a number of unique advantages to work based learners when compared to traditional methods. It does also, however, come with difficulties. The advantages include increased participation, as well as an increase in discipline and priority around online learning. The difficulties centre around participation in social tasks and on daily participation. Both reduce flexibility, but hold the advantages of increased priority and increased learning for some.

The research concludes with the presentation of a three path theoretical model of bite sized learning, each level suited to a particular context and course aim. The paths develop in sequence, and educators may choose the path which best suits their own teaching environment. The resulting paths force a choice between emphasising flexibility, involvement or learning, and advice is offered on how to choose the ideal model based on the learners involved.

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Table of Contents

Declaration.....	2
Abstract.....	3
Acknowledgements	4
Table of Contents	5
List of Figures	9
List of Tables	10
1. Introduction.....	11
1.1 Overview.....	11
1.2 Context	12
1.3 Scope.....	14
1.4 Aims & Objectives	15
1.4.1 Research Objective.....	15
1.4.2 Research Questions	15
1.5 Contribution	16
1.6 Structure of Dissertation	17
2. Literature Review	20
2.1 Introduction.....	20
2.2 Educational Research.....	21
2.2.1 Engaged Learning.....	21
2.2.2 Communities of Practice.....	27
2.2.3 Evaluating Teaching	30
2.2.4 Evaluating Learning	35
2.2.5 Learning Outcomes.....	38
2.3 Virtual Learning	43
2.3.1 What is Virtual Learning?	43
2.3.2 Online Learners	45
2.3.3 Virtual Learning Communities	47
2.3.4 Online Engagement	50
2.3.5 Online Learning Retention.....	51
2.3.6 Delivering Online Learning	54
2.3.7 Bite Sized Learning.....	56
2.3.8 The Structure of Online Learning	60
2.3.9 Measuring Engagement in MOOCs	61
2.4 Work Based Learning	64

2.5 Just in Time Learning.....	66
2.6 Attention & the Length of a Bite.....	67
2.7 Linking Involvement, Engagement and Learning.....	71
2.8 Conclusion.....	73
3. Methodology.....	76
3.1 Introduction.....	76
3.2 Action Research.....	78
3.3 Grounded Theory.....	79
3.4 Mixed Methods.....	80
3.5 The 3 Stage 'Stack'.....	81
3.6 Applying the Stack to BSL.....	85
3.7 Implementing Grounded Theory.....	89
3.8 Conclusion.....	91
4. Defining Measures of Involvement.....	93
4.1 Introduction.....	93
4.2 The Subject of Study.....	93
4.3 Data Gathering.....	94
4.4 Method and Results.....	96
4.4.1 Method 1: Activity Volume.....	96
4.4.2 Method 2: Daily Participants.....	101
4.4.3 Method 3: Participant Categories.....	103
4.5 Discussion.....	104
4.6 Conclusion.....	106
5. Teaching Format Snapshot.....	108
5.1 Introduction.....	108
5.2 Learning Analytics Analysis.....	109
5.2.1 Decrease in Engagement Within ITC.....	109
5.2.2 The decrease in the average number of students.....	110
5.2.3 Category Insights.....	111
5.3 Thematic Analysis Approach.....	113
5.3.1 Introduction.....	113
5.3.2 Data Collection.....	114
5.3.3 Analysis Methodology.....	115
5.4 Thematic Analysis Results.....	118
5.4.1 The Course Format.....	118
5.4.2 Flexibility.....	124
5.4.3 Social Interactions.....	128

5.4.4 Measures of Success	131
5.4.5 Participation Patterns.....	135
5.4.6 Discussion	139
5.4.7 Limitations	147
5.5 Stage 1 Discussion	148
5.5.1 Mixed Methods Analysis	148
5.5.2 Mixed Methods to Provide Rigour in Educational Research	151
5.5.3 Follow-On Experiments	152
5.6 Conclusion.....	154
6. Teaching Format Experiment	155
6.1 Introduction.....	155
6.2 Course Context	158
6.2.1 Course Details.....	158
6.2.2 Course Participants.....	158
6.3 Method.....	160
6.4 Results.....	161
6.4.1 Learning Analytics Output	161
6.4.2 Comparisons in Participant Numbers.....	166
6.4.3 Revisiting Participant Categories	168
6.5 Discussion	171
6.6 Conclusion.....	171
7. Teaching Format Theory.....	173
7.1 Introduction.....	173
7.2 Method.....	174
7.3 Results.....	175
7.3.1 The Buffet Format	175
7.3.2 The Daily Delivery Format	178
7.3.3 Task Length and Accessibility	184
7.4 Discussion	187
7.5 Conclusions	190
8. A Model for Bite Sized Learning	194
8.1 Introduction.....	194
8.2 The 3-Path Bite Sized Learning Model	194
8.2.1 Introducing the Model	194
8.2.2 Path 1: Buffet Delivery	198
8.2.3 Path 2: Daily Self Study	199
8.2.4 Path 3: Daily Social Learning	200

8.2.5 Choosing Between Daily Self Study and Daily Social Learning.....	202
8.2.6 A Modular Definition of BSL	203
8.2.7 Implementation of the Model	204
8.3 Conclusion	205
9. Conclusion & Future Work	206
9.1 Introduction.....	206
9.2 'Stacking Methods' to Build an Action Research Platform.....	207
9.3 Measuring Engagement in Open Online Education	209
9.4 The 3-Path Model for Bite Sized Learning	211
9.5 Other Future Work	212
References	213
Appendix A: Post-Course Survey	219
Appendix B: Course Examples	221
Course Introduction – Making Magic with Moodle	221
Unit Introduction – Day 1: Making Magic with Moodle	222
Unit 1: Activity 1	223
Unit 1: Activity 2.....	224
Unit 1: Tasks.....	225
Example Discussion	226
Appendix C: Output of Constructed Codes from NVivo	227

List of Figures

Figure 1: A definition of the bite sized learning format.	14
Figure 2: A visualisation of the methodology 'stack' used within this research.	77
Figure 3: The research stages employed within this thesis, demonstrated as a stack.	83
Figure 4: Stages 1 to 3 of the research methodology and the ways in which they link.	86
Figure 5: An outline of how data overlaps within each stage.	88
Figure 6: A sample of one raw Moodle log imported into Excel. Participant names are blurred to protect privacy.....	95
Figure 7: A map of auditing activity through the week by Participants 1 (P1) to 7. F represents the facilitator's activity.	97
Figure 8: A map of Completing activity through the week by Participants 1 (P1) to 7. F represents the facilitator's activity.....	97
Figure 9: Total audits recorded per day.....	98
Figure 10: Total completions recorded per day.....	99
Figure 11: The average auditing and completing activity measured across 6 instances of ITC.....	100
Figure 12: The average number of participants auditing and completing each day of the course.	102
Figure 13: The Average percentage distribution of participants in engagement categories for the ITC course.....	104
Figure 14: Individual Course Categorisation Data - each instance is represented in the legend by a different colour.	112
Figure 15: Participants taking part in auditing activity on each day of the April instance of MMWM.....	162
Figure 16: Participants taking part in completing activity on each day of the April instance of MMWM.....	163
Figure 17: Participants taking part in auditing activity on each day of the June instance of MMWM.....	164
Figure 18: Participants taking part in completing activity on each day of the June instance of MMWM.....	165
Figure 19: Participant category data for the April instance of MMWM.	169
Figure 20: Completion and consumption data for daily and buffet delivery of MMWM in April 2014.....	170
Figure 21: A 3-Level Model of Bite Size Learning, showing relationship between Learning, Involvement and Accessibility.	195

List of Tables

Table 1: Bloom's Original and Updated Taxonomies.....	36
Table 2: Chickering and Gamson's seven categories of effective educational practice (Chickering & Gamson, 1987).....	73
Table 3: Consumption data from one instance of the ITC course for 17 participants. Rows represent days, and columns represent participants. The data represents volume of auditing activity that day.....	110
Table 4: Details of the surveys administered to the series of six ITC instances.....	115
Table 5: Course Participants in the Daily Delivery vs Buffet Method Experiment ...	160

1. Introduction

1.1 Overview

Online education is an increasingly prevalent part of the learning landscape and learners now have access to a plethora of professional development materials and courses from around the world. This mass of open online education holds the power to benefit large populations of learners, many of which would not otherwise have been able to access personal development at all, through issues of time, location, funding, resources or otherwise.

Online education is not a panacea, however, and has many well documented issues when used in practice. Retention is one such issue, with many online courses sporting completion rates much lower than those of face to face classes, as will be discussed in the literature review found in Chapter 2. Open online education (a course which is free to take part in) is particularly susceptible to this problem, and the increasingly fashionable course category going by the name of MOOCs (Massive Open Online Courses) is notable for its very low completion rates.

Learner engagement is the particular aspect of retention which stands at the heart of this research. The overarching aim of this work is to test and develop an online education format with the intention of increasing learner engagement. This can be linked to improved retention rates and subsequently learner satisfaction and success.

The particular context of this work is the world of work based learning. Work based learning is an area which is characterised by busy learners with little time to participate and engage in their development. This, amplified with the engagement

issues already inherent in online education, makes for a very difficult area in which to engage an individual participant.

To this end, the research intends to investigate an emerging online education method for work based learners and present a model for teaching which aims to overcome many of the limitations currently present in their context. The strengths of online education are, in many ways, well suited to meeting the needs of work based learners. Implementation must be slow and careful, however, with an eye to the drawbacks, and ensuring that engagement issues present in both work based learning and online learning do not combine and multiply.

Another area in which progress must be careful and measured is that of methodology. Educational research has, in the past, been criticised for non-rigorous methods and results. To that end, this work has developed a stacked mixed methods approach which aims to employ the wealth of learning analytics available in online learning to accompany qualitative data. It is hoped that this combination produces more rigorous results and the method will be presented so that it may be of use to future researchers.

Finally, as a final product of this investigation, methods for measuring engagement in open online education will be investigated and an effective method proposed.

Engagement has already been stated as a key measure in the success of this type of learning, and so an accurate measure of this is vital.

1.2 Context

This research has developed through the author's teaching practice, which involved delivering Work Based Learning (WBL) courses via the online platform, Moodle.

These courses were delivered initially within the context of the Professional Development Programme at Edinburgh Napier University, delivered openly to academic staff with the aim of improving technology enhanced learning skills. These courses provide a basis for the involvement investigation presented in Chapter 4, and are then the subject of evaluation in Chapter 5.

The subsequent experiment, described in Chapter 6, was delivered in a fully open context; not just free to take part in, but open to participants from any institution. This was delivered via the website, TELTeacher.com, and participants came from universities both in the UK and internationally.

The emerging teaching method in question is called Bite Sized Learning (BSL). This method of teaching has not been explored in the literature thus far, but the term has been applied to a number of loosely related forms of learning. In the interests of clarity and in furthering research in this area, the author has developed a definition of BSL based on courses run over the past four years. The attributes of this definition are shown in Figure 1.

BSL is underpinned by a number of preceding educational theories and these will be discussed in detail in the literature review found in Chapter 2.

Bite Sized Learning (BSL) is...

1. fully online, and accessible anywhere with an internet connection
2. delivered in 'bite sized' chunks of learning, commonly around 30 minutes.
3. facilitated through active tasks which are carried out within participants' regular work
4. a format which runs over a short overall time, such as 1 or 2 weeks.
5. made from tasks which are delivered regularly and often; every 1 or 2 days.
6. active and social, requiring external action, feedback and interaction from the participants throughout.

Figure 1: A definition of the bite sized learning format.

1.3 Scope

This investigation takes place within a particularly defined context. It applies, first, to free-of-charge online education, both internal to an organisation (Chapter 5), and openly available to any individual (Chapters 6 and 7). Secondly, it takes place wholly within a work based learning context. This comprises any context in which the learner is participating in a course while also working on a full-time basis. A definition of work based learning, along with further details, is presented in Section 2.4. Finally, this work takes place within the academic sub-set of work based learning. The participants within the courses under investigation all work within higher education.

Due to this context, the results of this work are directly generalizable only to work based learners in academia taking part in open online education. Comments will be made throughout as to thoughts on how this may generalise to a wider context.

1.4 Aims & Objectives

1.4.1 Research Objective

The overarching research objective of this thesis can be stated as follows:

To create a model of Bite Sized Learning which is generalizable to open online education in an academic work based learning context, and which is useful to educators in designing the methods and structure of their own learning materials in future.

This objective will be achieved by completing the following three stages:

- Evaluating a set of existing bite sized learning courses with the aim of assessing the current state of the format in meeting the needs of academic work based learners.
- Running an experiment to test improvements to the method, based on stage 1 feedback, and to confirm the conclusions of stage 1 in a wider context.
- Creating a theoretical model of bite sized learning based on the research conducted in stages 1 and 2.

In addition, to ensure that the work is properly grounded, it is important to consider a number of areas of previous research. To this end, the literature review presented in Chapter 2 will cover the specifics of work based learning, open online education and a number of areas of general educational research relevant to bite sized learning.

1.4.2 Research Questions

In order to achieve the research objective, the following research questions will be answered:

1. How can learning engagement trends be effectively measured and compared in a bite sized learning context?
2. Does bite sized learning promote greater engagement with learning in academic work based learners than traditional professional development methods?
3. How can the components of bite sized learning be most effectively employed to engage work based learners in this context?

1.5 Contribution

The knowledge contributed by this thesis mainly stem from the research questions proposed in Section 1.4.2. These contributions are as follows:

1. The proposal of an effective method for measuring engagement in open online learning. (Resulting from research question 1)
2. The creation of a 3-Level Model for Bite Sized Learning. (Resulting from a combination of research questions 2 and 3).

In addition, there is a methodological contribution to knowledge proposed by this thesis. This results from the action research and mixed methods approach which was employed to complete the research objective stated in Section 1.4.1. The cyclical nature of the resulting quantitative and qualitative testing has resulted in the design of a stacked methodology which enables iterative evaluation and development. This was found to be particularly suited to the design of an emerging teaching method.

As a result, the following is a third contribution to knowledge proposed by this thesis:

3. The proposal of a methodology 'stack' approach which is demonstrated as a rigorous method for testing and developing new methods of online teaching.

The 3-level model for bite sized learning, contribution 2, is the core outcome of this thesis. It is intended to enable any educator to develop bite sized learning interventions for use with their own students in a work based learning setting.

However, the methodology and engagement measurement outputs (1 and 3, respectively) were developed in the process of researching this model, and may also be useful to researchers in this area in the future.

1.6 Structure of Dissertation

It may be useful to outline the structure of this dissertation for readers.

Chapter 1 is an introduction, intended to outline the dissertation from purpose to contribution.

Chapter 2 presents a review of the literature, beginning with an overview of the general educational research literature that is relevant to this project. Next, the online education literature is explored in more detail, before finishing with the areas of research which directly underpin this project, such as work based learning and just in time learning. The chapter finishes with a discussion around the relationship between involvement, engagement and learning, the results of which heavily inform this work.

Chapter 3 outlines the methodology which was used during this research. It presents the literature which informed the methodology development process, and it outlines how the stack functions in supporting robust educational research.

Chapter 4 then begins the research by presenting an investigation on the best method for measuring and comparing students' engagement in open online learning. This takes the form of an evaluation of six existing course instances, all of which were run by the author. Chapter 4 aims to evaluate methods for measuring engagement and choose the most reliable method for use in later stages of the work.

Chapter 5 presents stage 1 of this investigation into bite sized learning, and provides a snapshot of the current state of the format. This will be uncovered through a mixed methods analysis, combining learning analytics with qualitative survey results to produce a deep understanding of how students interact with the course, and what the perceived strengths and weaknesses of the format are. This understanding will emerge in the form of an initial theory of bite sized learning.

Chapter 6 presents Stage 2 of the research. This builds upon the work done in Chapter 5 by running an experiment around the main question raised by the initial analysis: is the daily format the most effective way to deliver bite sized learning? This experiment is intended to test one of the core principles of the format, and to uncover the best method for delivering bite sized learning.

Chapter 7 finishes the practical element of the work, completing Stage 3 of the research. This takes the form of a final mixed methods analysis, combining qualitative and quantitative data sourced from the Chapter 6 experiment, and using it to develop and refine the theory which began to emerge in Chapter 5.

Chapter 8 takes the refined theory which emerged from Chapter 7 and transforms it into a theoretical model for bite sized learning. This model is intended to outline the components that are involved in bite sized learning and how the various interrelations lead to elements of strength and weakness which clearly split it into

three levels. The model will be broken down and its context of use will be explained.

The final result will assist any educator or trainer in developing bite sized learning style courses in an effective way in future.

Chapter 9 finally presents overall conclusions and potential areas for future work.

2. Literature Review

2.1 Introduction

This literature review intends to describe the prior research which has informed the development and processes of this work. The great majority of this literature falls into the educational research category, although some outside influences will be mentioned when they add insights. Within educational research, the main areas which will be explored are traditional educational research and online learning.

The traditional educational research will cover the environment in which this work is placed, including the concepts of engagement, learning communities and then evaluation of learning. These form the foundation of this work.

Next, the specific area of virtual learning will be covered, intending to explore the particular considerations of delivering education in a virtual context.

Following that, areas very specific to this work will be covered. This includes work based learning as a category of learning within the main educational environment, and it includes two theories in particular which informed the development of the learning format in question: BSL. The two theories in question help to justify the initial form of the format which will then be researched and developed throughout this work.

Finally, a discussion will be presented which shows the link between involvement, engagement and course success, thus justifying the measurements and outcomes that will be presented later in this work.

The literature presented in this Chapter will cover the subject of this research only, and not the manner in which it is researched. Chapter 3, to follow, will cover the research methodology employed during this work.

2.2 Educational Research

2.2.1 Engaged Learning

This work encompasses a number of sub-genres of education, from online learning to work based learning. But one theme which is prevalent throughout is that of engaged learning. The concept runs throughout each of the three research questions outlined in Section 1.4 which provide more detail on the particular focus. Therefore, in order to build on solid foundations, it is worth exploring first what is meant by engaged learning.

Engaged learning is a concept that encompasses all methods of learning which promote interaction and involvement by the learner throughout the process. Engaged learning is a term which has been referred to under different guises, including active learning, social cognition, constructivism and problem-based learning (Conrad & Donaldson, 2011).

Central to this idea of engaged learning, is the movement away from traditional didactic approaches and towards student centred learning. The idea of teacher-as-facilitator is a century old, having been introduced by Dewey in 1916 (Dewey, 1997), and has been explored by many researchers since. Dewey's work was mostly aimed at adolescent learners, but Knowles' theory of andragogy (1980) later extended this to adults. Andragogy is a theory of adult learning, stating that participants want control over their learning, and for it to be delivered in the context of their own knowledge and experience. This is underpinned by Piaget's work on constructivism

(Piaget, 1969) which states that learning is more effective when the material is connected to the learner in some way.

The author believes that these concepts are central to good teaching. This work takes the approach of putting students at the centre of any learning experience, allowing them to connect that learning to their own lives. BSL is built around this concept. It offers short bites of tuition which form a starting point for the student's exploration. Participants are then directed to the more substantial chunks of active learning which take the form of work-based tasks. These are intended to be carried out within the workplace, in real time, achieving active working goals. These elements are the definition of engaged learning: conveyed information is kept short, the bulk of learning is contained within activity, and that activity is placed within the student's real-life context. This is the ethos behind BSL teaching, and keeps the teaching as student centred as possible.

By way of justifying the use of engaged learning in the first place, Bornstein and Bruner discuss the requirement for interactivity in any learning if it is to promote development (Bornstein & Bruner, 1989). Vygotsky's work confirms this by stating that students learn from each other during interaction, building a more complex view of the world in the process (Vygotsky, 1981).

Vygotsky, through his 'zone of proximal development' theory, described the increase in ability of a student when working alongside a teacher or a more experienced peer. Piaget, on the other hand, believed that learning was improved by pairing learners of equal experience and authority. In that situation, he argues, it is more likely that contradictions in problem solving ideas & techniques would be resolved than might occur in a pairing of unequal authority.

This research intends to explore very specific applications of education, namely: fully online, short-form, interactive learning in an academic professional development environment. One tenet which is important to this is knowledge exchange and collaboration. The research questions stated in Section 1.4 revolve around improving engagement and retention in short-form courses, and social effects will be a factor in this. For the purposes of this work, Piaget's view on social, educational pairings will be followed rather than Vygotsky's. The idea of equal partners would seem more relevant to groups of experienced, adult learners with a great deal of knowledge to share. In order to encourage this knowledge exchange, that equality of status and experience would seem more appropriate than the mentor/learner relationship described by Vygotsky, and the approach is certainly more sustainable when many courses are run or group numbers become large. In these cases, tutors or more experienced peers may be too small in number to support every participant in an effective manner.

Looking now at the wider picture and considering the aims of a learning community, one of the most commonly used educational frameworks in the context of collaborative, online learning is constructivism. Palloff and Pratt state that collaboration is the 'heart and soul' of any online course, fostering deep engagement, and that it is always closely associated with constructivism (Palloff & Pratt, 2003). BSL is a teaching method which values and promotes social learning, encouraging peer support, feedback and contribution. For that reason, this work will utilise a constructivist epistemology, an approach followed by the majority of researchers in the online learning field since the approach became mainstream in the 1990s (Jonassen, Mayes & McAleese, 1993).

Piaget was a proponent of constructivism, a process of learning through interacting with the world, solving problems and building on our previous experience. Problem based learning as a concept complements the constructivist approach and is one that produces a great deal of engagement (Watson & Groh, 2001, p.21). The main principles of individual constructivism, as told by Smith and Ragan, are that knowledge is learned through personal interpretation and is integrated with and shaped by our own experience (Smith & Ragan, 1999, p.15). This knowledge can then be given more solid meaning by investigation from multiple viewpoints, i.e. in a social learning setting.

This again informs the structure of a daily task within BSL. Students are offered a small chunk of information, and are then offered a task to complete. This task always includes a problem to solve, most often in the form of a question on applying the day's learning to the student's own context, and to carry out an activity on that basis. Finally, the student is asked to feed back to the group on the experience and how the material was applied, and this, in an ideal world, leads to the discussion of multiple viewpoints.

While this approach can lead to very rich peer-group conversations, it is often necessary for a tutor to foster the growth of these exchanges. This is especially true within a small group, or one which is newly forming, both of which apply to most instances of BSL. Kearsley (2000) is one researcher who offers insight into this with his summary of the true role of an online tutor. That role is to encourage participation and interaction as much as possible, both with the learning material and with fellow students.

Collison, Elbaum, Haavind and Tinker then underline the tutor's role through a warning given around the constructivist view. They claim that there is strong evidence for a "right time" to give learners a little guidance, or to "give them a critical piece of information to help them move forward," (Collison, Elbaum, Haavind & Tinker, 2000, p.97). Equally, Garrison and Cleveland-Innes discuss the concept of teaching presence, provided by a tutor, just one part of the overall topic of social presence (Garrison & Cleveland-Innes, 2005). Teaching presence is important, they argue, because it maintains the community of enquiry, while social presence builds upon it by fostering trust and belonging.

These concepts are all felt to be important within BSL, and are implemented in the form of supportive rather than leading facilitation of discussions. Within each course task, students are encouraged to start the conversation, and the tutor attempts to supportively grow it from there. In some cases, the tutor may be required to start the conversation, and this will be taken as the "right time" for guidance, allowing the tutor to provide some small insight and a starter for further discussion.

Conrad & Donaldson (2011) expand upon the role of the tutor by highlighting that the traditional teaching role is now less formal and should often be offered to the students, giving them much more control over their learning environment and experience. They state that the student should take responsibility, possibly the lion's share, for gathering learning materials and driving discussion, making them active partners in their learning. This results in engaged learners with more motivation to follow-through on their learning.

Another way to build that motivation comes from Johnson who states that further engagement is built by sharing the results of student work with the outside world

(Johnson, 1998 cited in Conrad & Donaldson, 2004). This adds value to the work done, and increases motivation as a result. This is echoed in Knowles' theory of Andragogy, and is felt, by the author, to be a very well supported aspect of the learning mix. The concept is implemented within BSL by ensuring that participants are working on real-life tasks, rather than theoretical practise. Tasks are intended to be acted on by WBLs within their active working context, and have an impact on work-based goals. Furthermore, Conrad and Anderson's idea of allowing students to gather and deliver learning materials is felt to be very valuable. As a result, BSL tasks do include resource curation and review, as well as sharing and discussion with the group.

One final element of developing engagement with learning is that of clarity and transparency. Gagne and Driscoll state that being transparent with teaching methodologies can be a key factor in creating buy-in from students (Gagne & Driscoll, 1988). This should involve a clear description of the teaching methodology, along with various ways to engage with and learn about these methods. It can also help to associate an expectation of success with the implementation of these methods. Conrad and Anderson (2004, p.9) add to the requirements of engaged teaching: a safe and student centred environment in which to learn, and in which self-assessment is encouraged. Through all of these requirements, an environment is born in which the student understands the requirements of engaged learning themselves, and consequently aids the teacher in creating one.

Transparency and safety is something which is intended to be included within any BSL intervention: an outline of the approach, the intentions and the expectations on behalf of both the tutor and the student. This will help to build the engaged

environment described by Conrad and Anderson above, and foster successful courses.

This section has discussed the underpinning research around engaged learning, a concept which is key to this investigation. This body of research applies to learning in general, and is most often based around traditional face to face teaching, but it can be applied equally well to online education and BSL in particular. As has been discussed, BSL is intended to be very student centred, as directed by Piaget.

Material is delivered and then tasks are directed to be completed within the participant's own work. This directly connects learning to the learner, requiring them to transfer and apply it to their own working context. This is a core tenet of Knowles' work on Andragogy also, ensuring that work is related to concrete aims within the learner's own life. Finally, constructivist learning is well represented by this type of material and task format in that material is directly applied to the real world and is built upon elements of work that participants already carry out, therefore integrating it with their previous experience.

The effect of social interactions on learning have been covered in brief within this section, specifically in the context of fostering engaged learning. Since it is a core element of BSL, however, it is worthwhile exploring this area in more detail.

2.2.2 Communities of Practice

In the previous section, evidence was provided to show that social interactions are one driver of engagement, and can provide a great deal of support around learning. It is clear that, in the right context, it is of value to foster these interactions. In order to do so, it is worth exploring the community as a whole, and literature which describes the formation and effect of such communities.

Communities of practice are commonly attributed with increasing the efficiency and effectiveness of learning and development (Lave & Wenger, 1991). One of their key characteristics, as extolled by Lave & Wenger, is their ability to support a novice entrant to a subject area or profession in becoming an expert over a period of time. The process of 'legitimate peripheral participation' is central to this journey and involves new entrants to a community acting as observers, learning vicariously in the early days, before becoming much more active contributors as their experience and knowledge increases.

Encouraging active participation in a community of practice can be quite a difficult process, however. There is a large tendency for people to act as 'lurkers' or 'free-riders' - users who continue to view the outputs of a community, but don't contribute. (Krishnan, Smith, Tang & Telang, 2004).

Lurkers are users who do not contribute to a community, preferring to take a read-only approach. Beaudoin (2002) studied the behaviour of lurkers in his fully online course, tracking 55 student learners in total. He classified his students into 3 camps:

- High Visibility - Posted more than 1000 words within course forums
- Low Visibility - Less than 100 words in course forums
- No Visibility - No contributions to course forums

Beaudoin discovered that 43% of his cohort were in the 'no visibility' category, contributing nothing to group discussion and community building. Upon further investigation, the main reasons for this were stated to be: "they simply preferred to read what other's wrote, or that they had thoughts but others made similar comments before they could post anything themselves" (P.150)

To create a successful online community of practice, these obstacles must be overcome. To this end, studies have explored incentives that can encourage active participation (Krishnan, Smith, Tang & Telang, 2004) and sanctions that may discourage 'lurking' (Ginsburg & Kambil, 1999). Some examples of these incentives include offering faster download times, granting a higher view of the network (Kamvar et al., 2003) or recognising people's contributions through acknowledgement in publicly available material, such as group emails (McKenzie and Lee, 1998).

Communities of practice are a strong component of BSL, and are included in the definition of the format which was outlined in Section 1.2. This is implemented by integrating community building into the structure of BSL, chiefly within the assessment mechanism. Upon completing the core of an activity, the final task for every student is to post a message within the discussion forum answering one or two questions. These questions revolve around opinions on the tool or technique being taught, and how that could be implemented within the student's own work. This serves the multiple purposes of logging completion of a task, inciting reflection on learning and encouraging discussion around the activity that took place. Therefore, every time a student 'completes', they are encouraged to kick-start discussions which then foster the building of a community. This allows BSL to draw from all of the benefits of community learning described above, but, of course, it also ascribes BSL with the weaknesses afforded by the inclusion of social interaction.

In order to mitigate some of the issues, participants are encouraged to participate in social interactions through the medium of assessment: each task requires the participant to complete that task by posting feedback, thoughts or an answer to a

question on the discussion forum. Then participants are encouraged to discuss these postings. This is intended to provide incentive to move from a no or low visibility state through to a high visibility state.

Furthermore, the supportive facilitation style described in the previous section has the added effect of recognising people's contributions in a public space when done correctly. This helps to encourage further participation by not only that learner, but others, as described by Mckenzie and Lee (1998).

This section has helped to inform the social structure of the BSL format, and the previous section has informed the learning materials and activities that make up this format. Now that this is in place, the next step is deciding how the success of this format will be measured. For that, one needs evaluation.

2.2.3 Evaluating Teaching

Evaluation of education is a complex and subtle activity. Firstly, it falls into two categories which are relevant to this work: teaching and learning. The measurement of learning is a traditional method of evaluation, taking the form of examination and assessment. Success in learning may suggest success in teaching. But, evaluating teaching can be an approach in itself, and is especially relevant to an educational format like BSL which is not formally assessed. Therefore, this section will begin the conversation on evaluation with an exploration of teaching evaluation.

Angelo and Cross set out three main questions an instructor should answer when looking to evaluate their teaching (Angelo & Cross, 1993):

- What are the basic elements I'm looking to teach?
- How can I discover whether students are learning these elements?

- How can I improve student learning next time?

As has been discussed, the BSL format has been in use by the author prior to the beginning of this research project, and the approach advocated here by Angelo and Cross was followed during its development. The creation of each course began with step 1, which represents the creation of learning outcomes, something which will be discussed in more detail in Section 2.2.5. Steps 2 and 3 are then represented by a follow-up survey which is administered after each course. This covers questions around both learning and suggestions for improvement. This survey data will form a large part of the research to come and provides evaluation of both the teaching format and the teaching itself.

Any teaching evaluation should also be informed by the warning from Brookfield (1995) that evaluations of teaching often tend towards rating the performance or likability of the teachers, as opposed to the effectiveness of teaching or learning.

In online learning the measure of performance or popularity is naturally diminished by the absence of an in-person teacher, but Palloff and Pratt (2003) state that, instead, attentiveness and responsiveness are often sub-consciously rated. This results in high evaluation results for instructors that model the behaviour they would desire from students. It could be said that this is an improvement on the limitations mentioned by Brookfield; leading by example, in this case, will not only produce good course evaluations, but will encourage students to act as better online participants.

For the purposes of this project, the object of investigation is a teaching format, rather than the actions of the teacher, however. The format used to teach is one aspect of teaching, and the act of facilitation and tutoring is another. In discussing teaching evaluation here, it is with the intention of uncovering the success of the

format rather than the success of any facilitation involved. It is acknowledged that the two are linked in many ways, but analysis later in the project will aim to uncover thoughts specifically around the format, separating them from thoughts on the tutor. This detailed analysis, concentrating on that distinction, will help to mitigate the issues described by both Brookfield, and Palloff and Pratt, in which likeability, attentiveness and responsiveness can bias results.

A further method for assessing teaching, and which is also applicable to full training programmes as opposed to individual learning interventions, is Kirkpatrick's 4-Level Training Model (Kirkpatrick, 2006). Kirkpatrick first published this model in 1959, and it has been updated a number of times since. The model can be used to evaluate an individual training session, equivalent to one daily task within a BSL course, or it can be applied to a full training programme, such as an entire BSL course.

The model contains four levels of evaluation, as follows:

1. Reaction - How do participants react to the training? Think in terms of perceptions of value, feelings towards the instructor, thoughts on presentation, etc.
2. Learning - How much knowledge have the participants gained as a result of the training?
3. Behaviour - How are trainees applying their training in ways that change their common behaviour?
4. Results - Did the training meet the aims that were set down at the beginning? This may be anything from increased employee satisfaction levels to improved sales.

The Kirkpatrick model is aimed at the corporate training market rather than the traditional education world. It is important to be aware that while the Kirkpatrick model suggests that the levels are progressive and increasingly important, that is sometimes not the case. For example, reaction can be a greater measure than results if the results the evaluator is measuring aren't well aligned with the organisation. And, it is not strictly necessary for the reaction to be all positive for learning to take place, or behaviour to change. This latter point is one of the biggest criticisms of the Kirkpatrick model; the use of learner reactions as a measure of success in the first place.

This criticism is prevalent, in part, due to the over-reliance on 'happy sheets' within the corporate and educational training environments. Trainers are often criticised for believing that a Likert scale, like to dislike, is enough to evaluate a training programme, but two separate scientific studies also found that there was little correlation between reaction and learning. Dixon (1990) measured reactions in the form of enjoyment, and discovered no link to post-test scores, while Warr and Bunce (1995) found no link between their 3-part model of reaction (perceived difficulty, enjoyment & usefulness) and the achievement of outcomes. Kirkpatrick himself counter-argues that if the initial reactions to a programme of training are poor, then it is unlikely that learning will result.

It is felt by this author that the criticisms should be considered, but in the context of eLearning, reactions to course material may have a stronger effect due to the lack of face to face support. When in a classroom or a seminar, students have the chance to immediately ask questions, or are required to stay for at least a short time. This may help to mitigate a negative first reaction. During online learning, however, a bad

reaction can send a prospective student away immediately, or could create a barrier great enough that it's impossible to recover on their own. Therefore, reactions will be considered within the context of this work.

Another criticism of the Kirkpatrick model is that it often leads to evaluation through anecdotal evidence rather than solid scientific information (Eason, 2013). There is a tendency to record that which is easy to record, over-relying on personal opinions which are not thoroughly analysed. During the theory and experimental stages of this work, the author will be following a structured coding process, making every effort to mitigate subjectivity and to categorise participant personal responses into reliable qualitative data. This process will go far to mitigate this potential problem, but the risk will be logged and borne in mind throughout.

Many of the criticisms of the Kirkpatrick model seem to stem from trainers who measure at one level of the model only (most commonly level 1, the easiest), and believe this presents solid evidence. The purpose behind the model, however, is to triangulate a measure of success using more than one level. This work will draw evidence at more than one level in an attempt to provide a robust evaluation of the training provided.

It is interesting to note that the Kirkpatrick model applies not only to the evaluation of teaching, but to the evaluation of learning. Levels 2 and 3 use eventual student learning as a measure of success for the teaching approach, which makes intuitive sense to this author. It highlights the fact that teaching and learning are inextricably linked, and therefore a method of evaluation for teaching relies on a reliable evaluation of learning. Therefore, before choosing a teaching evaluation method for this work, a discussion on learning evaluation must be undertaken.

2.2.4 Evaluating Learning

It has already been argued that in evaluating teaching, you are, in effect, starting to evaluate learning. But learning can be affected by much more than just teaching methods, and individual students may respond differently to varying teaching methods.

To begin the discussion on learning, it is worth considering that it can occur at a number of levels. Bloom's taxonomy is one very well-known way to categorise these levels, ranking them in terms of the depth of learning involved. Bloom's original taxonomy (Bloom, 1956) used the following categories: Knowledge, Comprehension, Application, Analysis, Synthesis, and Evaluation. Evaluation is considered the deepest form of learning.

In 2001 Bloom's taxonomy was modified (Krathwohl, 2002) to better fit modern education and to mitigate its weaknesses. As well as renaming and reordering the main cognitive levels (shown in Table 1), the revision moved to a two dimensional format, working with both knowledge types and cognitive processes. The knowledge types are based mostly on Bloom's original Knowledge sub-categories, and the Cognitive Processes parallel the main 6 levels in Bloom's original taxonomy. This means that each level of cognition can be categorised along with the type of knowledge which is relevant to a particular learning activity. As such, the taxonomy is designed to be a more comprehensive framework on which to build and evaluate learning outcomes, offering a target for both level of cognition and type of knowledge.

Bloom's Original Taxonomy	Bloom's Updated Taxonomy
Knowledge	Remember
Comprehension	Understand
application	Apply
analysis	Analyse
synthesis	Evaluate
Evaluation	Create

Table 1: Bloom's Original and Updated Taxonomies.

A taxonomy that has emerged alongside that of Bloom's is the Structure of Observed Learning Outcome (SOLO) Taxonomy. This models the emerging levels of understanding a learner goes through in processing a subject, and is useful to teachers in understanding and measuring the learning process. The levels are as follows:

- Pre-Structural: Little understanding of the subject
- Uni-structural: basic understanding, concentrating on only one relevant aspect
- Multi-structural: Some understanding, looking at various aspects of the subject, but not linking them together
- Relational: The various aspects of the subject have been integrated into one mental model, giving a good understanding. This is normally considered adequate in terms of 'knowing' a subject.
- Extended Abstract: Knowledge is abstracted and applied to other areas. The knowledge can be re-processed and used to create new ideas.

While Bloom's taxonomy is very useful to evaluate at what level learning occurs, the SOLO taxonomy helps to evaluate a learner's progress along the learning journey with a particular subject. It can also be used to inform the learner themselves of that journey.

For the purposes of this project, the Kirkpatrick model, discussed in the previous section, seems to offer a very effective fit in measuring the success of each course. There are a number of reasons for this. Firstly, the context of BSL within this study is that of staff training, something which the Kirkpatrick model was specifically designed for. This immediately suggests a good fit.

Next, in exploring both Bloom's and the SOLO taxonomy, it is clear that measurement of these levels will be difficult within the BSL context at this stage. BSL does not employ a traditional assessment method. The results of learning are assessed solely through analytics and qualitative feedback. Levels of understanding would be difficult to assess through these means alone. In contrast, reaction and behaviour in particular are more practical measures for this context and so Kirkpatrick's model will be most suitable.

What can also be judged, and a core concept within this work, is engagement. This will be shown to have links with learning (Section 2.7) and therefore a tentative success in terms of Level 2 of Kirkpatrick's model. Therefore, the aim is not to measure the level of learning at this stage, but to measure the volume of engagement, which suggests learning, when compared to traditional professional development methods. If volume of engagement is increased, then future work could determine whether this clearly evidences learning, and whether that can be moved to higher levels of learning within any relevant taxonomy.

Finally, Kirkpatrick's Level 3, a change of behaviour, is something that is more easily measured within qualitative feedback. This is a measure of success that will be used within this project, and allow deeper evaluation of success.

In future, it would be very interesting to investigate the levels of learning present within BSL. By implementing different methods of task completion and offering light assessment, this could be implemented and the BSL method further refined.

Now that evaluation methods have been discussed, it is necessary to discover measures against which BSL will be evaluated.

2.2.5 Learning Outcomes

Learning outcomes are often discussed within education and have been mentioned in passing already within this Chapter. They naturally continue the conversation around evaluation because it can be argued that only with well-defined learning outcomes is it possible to determine whether learning of any kind has taken place. In the vocational sector, in particular they are normally based on competencies which help to assess work based skills (Scott, 2011). In investigating it further, the concept of learning outcomes also helps to inform the underlying structure of BSL. For each of these reasons, it is worth exploring learning outcomes in depth.

Constructive alignment is a method for devising both coursework and assessment which directly address learning outcomes, something which may not otherwise be achieved in traditional lecture and exam based education (Biggs, 2003). This difference is characterised by the following categories of knowledge: 'declarative knowledge' and 'functioning knowledge'. Declarative knowledge is "knowing about things" and functioning knowledge is being able to put that knowledge to work by problem solving or re-purposing (Biggs & Tang, 2007, 72).

When applied to creating Learning Outcomes, in order to achieve higher levels of understanding, the teacher should state what they want the student to do. They should be required to, “perform their understanding, not just tell us about it,” (Biggs, 2003). If learning outcomes are stated as tasks, in this way, then the level of understanding becomes implicit based on the verbs employed: the student must achieve a level of understanding which allows them to perform the task. For example, if a student is required to memorise within a learning outcome, then that conveys low level understanding, according to the SOLO taxonomy (Biggs & Tang, 2007, p80). This is an example of declarative knowledge. A requirement to Theorise or reflect, however, suggests a much higher level of understanding, and demonstrates functioning knowledge. The SOLO taxonomy provides verbs which can be used to create a mix of low, mid and high level understanding within Learning Outcomes, and provide a useful structure for creating specific and measurable outcomes.

Bloom’s Taxonomy (Bloom, 1956) or the updated version (Krathwohl, 2002) can equally be used to understand the levels of learning when creating learning outcomes. The updated version of Bloom’s taxonomy shown in the second column of Table 1 is particularly useful for this purpose due to the verb descriptions which can easily be applied to tasks.

In creating Learning Outcomes for a course, the more Learning Outcomes that exist, the harder it is to create an aligned learning experience (Biggs & Tang, 2007, p71). This is extremely relevant to the BSL context. One hypothesis that underpins this project is the idea that short, focussed learning activities are more engaging and more effective for a work based learner than longer, more involved activities. Each

bite-sized chunk of information is based around one task, one focussed 'chunk' of information, and so normally there would be only one learning outcome per activity. This allows a high level of constructive alignment within BSL: the learning activity and the assessment deliverable (in this case discussion posting feedback) can be fully aligned to this one learning outcome.

This is underpinned by work carried out by Bodie, Powers and Fitch-Hauser in which they reported that short, daily tasks were effective in skills development (Bodie, Powers & Fitch-Hauser, 2006). They raise the concept of sequence learning, and the fact that this it is a "chunking process". By teaching small chunks of related information in a sequence, "relational chunking" is employed, and this helps to improve competence in certain areas. This naturally seems to support the approach of "chunking" material into units which achieve specific learning outcomes, keeping constructive alignment high. In many cases learning outcomes may be sequential, as described by the relational chunking concept above. This is the approach followed by BSL, leading the student through a set of steps which achieve individual learning outcomes, followed by the overall course goal.

In exploring learning outcomes, criticisms towards the approach must also be discussed. While the concept of learning outcomes has long been established in education of all levels, recently they have been under increasing attack. The initial fear, for most, is that learning outcomes simply become a way to monitor teachers and academics, becoming a bureaucratic measure rather than a tool for learning (Hussey & Smith, 2008). In the context of this work, learning outcomes are not being used for assessment of the course itself, so this aspect of the argument will not be

elaborated. Instead, the following paragraphs will concentrate on the strengths and weaknesses of learning outcomes in facilitating learning.

One very common critique of the approach is that it is extremely difficult to word a learning outcome in a way that is entirely unambiguous. In trying to define the outcome precisely, there is a temptation to become either over-prescriptive or too vague (Scott, 2011). The former leads to an outcome too detailed to apply to a useful number of students, and the latter applies to many, but becomes too generalised to be measured.

Adams (2008) highlights the effort and intellect that must go into formulating a learning outcome which avoids this ambiguity and becomes useful to students. The inputs are numerous, and include qualitative measures such as past experience and student feedback, along with the more traditional assessment criteria and course descriptors. The process is far from the trivial templating exercise described by some, instead involving a “dynamic and cathartic process of creation,” (Adams, 2008).

If the tutor manages to hit a middle ground between ambiguity and over-prescription then they face another critique: the stifling of exploration and creativity in learning. If the outcome is predetermined, then it may be impossible for the student to discover their own path, or even to discover or create their own learning within a wider subject (Buss, 2007). Many argue that this goes against the concept of student-centred learning, taking away any power the student has in defining both the path and destination of their learning.

Looking to the students themselves, one study did find that the majority of learners found learning outcomes useful (Brooks, Dobbins, Scott, Rawlinson, & Norman,

2014). They were cited as being valuable guides to the syllabus being covered, for note taking and for planning revision. On the other hand, the same study discovered that, despite this, many students found learning outcomes could be confusing, and often lacked clarity on the depth of learning required.

In defining whether learning outcomes are useful to this work or not, the work of Hussey and Smith (2008) offers valuable insight. While Hussey and Smith are often seen as detractors of learning outcomes in general, they acknowledge that they provide value in one particular context; the teaching event or session. They define three current contexts of use for learning objectives: 1. Teaching events, 2. Modules or short courses, 3. Degree programmes (Hussey & Smith, 2008).

Within the context of a module or short course, they argue that learning objectives become simple lists of contents. Applied to a degree programme, the concept of learning objectives does not apply as anything they would refer to would be far too broad to be defined in this way. However, when applied to one lesson, one learning event, learning objectives can be a useful tool. If used flexibly, and with an open mind to wider exploration, they can provide guidance for both student and teacher.

Learning outcomes are clearly not suitable for all contexts, and come with a large number of strengths and weaknesses. In the context of BSL, however, they seem well suited. Each learning outcome is being applied to individual learning events, or bites, in order to provide alignment. The activities then require the learner to apply the learning to their own work, naturally encouraging flexibility and exploration.

Finally, the 'assessment' component is simply reflection on the learning, based on the original outcome, thus continuing to encourage a student centred approach. This

all complies with the advice of Hussey and Smith (2008) in applying learning outcomes to learning events.

That concludes the general educational research which underpins this work. The overall concepts of engaged learning and communities of practice have been covered, and shown to form the basis for the BSL format. Next, learning and teaching evaluation have been explored and methods have been chosen which suit the context and aims of this research. Finally, the prior research around learning outcomes have been shown to support the structure of BSL, in particular the short, chunked, daily tasks.

Next, it is time to delve into the particular delivery context of Bite Sized Learning: online delivery. The following sections will explore the particular considerations when teaching in a virtual or online context, and what implications these have for the development of BSL, and for this research as a whole.

2.3 Virtual Learning

2.3.1 What is Virtual Learning?

Virtual learning is a sub-category of general education, the topic which has been discussed thus far, and one problem within the field is the large range of terms used to describe the category. Some of the most common include online learning, distance learning, distributed learning, computer mediated learning and e-learning (Rudestam & Schoenholtz-Read, 2010, p.2). Virtual learning is most commonly learning which is taken part in at a distance and using technology to access the learning materials and activities. Distance learning does not necessarily equate to virtual learning (traditionally paper-based materials were mailed to students) but modern distance learning providers rely heavily on virtual learning methods.

Blended learning is another term commonly used within the field, and refers to an amalgamation of both online and face-to-face learning (Rudestam & Schoenholtz-Read, 2010, p.4). In this approach, face to face teaching is commonly supported by further online materials and tasks.

Online learning has been found to have many benefits for the learner, such as the following outlined by Ally (2008):

- Location and distance independent
- Time-zone, and time independent
- Access to subject and industry experts
- Situated learning is made possible, allowing on the job learning, and contextualisation of materials

All of these make for a very useful learning approach, and as such, industry is increasingly using eLearning as a staff development tool (Simmons, 2002). The argument over whether eLearning is an improved method of instruction over face to face learning is well debated, and in fact is considered moot by some (Clark, 2001 cited by Ally, 2008; Kozma, 2001 cited by Ally, 2008).

This research takes the view that Ally (2008) is correct in outlining many benefits in virtual learning for many users, and the BSL format is a solely online teaching methodology, as defined by point 1 in Figure 1. The research will explore, however, the disadvantages of online learning through participant feedback and analytics. These insights will help to build instruments into the BSL format which will mitigate general online learning downsides, enhance strengths and create an effective virtual learning method for work based learners.

With regards the terms to be used, online learning seems to this author to apply more suitably to the BSL context. BSL is, as has been said, online only, with no possibility of paper based distance learning or other delivery formats. For that reason online learning would appear to be a majority sub-set of the virtual learning category, and a suitable term to apply to this work.

Having now defined the format, the next area to explore is that of the learners which utilise the online learning method.

2.3.2 Online Learners

Online learners are those that choose to take up a course of learning delivered solely via the internet. Their characteristics are often quite unorthodox, when considering traditional higher education. They are often balancing their educational needs alongside the running of a family and maintaining a career (Conrad & Donaldson, 2012, p9), and would be strongly considered as adult learners when it comes to pedagogical approaches.

The state of a typical online learner is an important consideration in developing the BSL format. Following the student centred approach discussed in Section 2.2.1, the student is at the heart of this learning design, and it should cater to their average characteristics as much as possible. This will be discussed in more detail when the particular students relevant to this study are covered: work based learners.

Next, it can be useful to consider what characteristics a person must have in order to be a successful online learner. Palloff and Pratt (2003, pp.6-8) provide a summary of the traits they have discovered lead to successful online learning:

- access to a computer and the internet

- open-minded about sharing of personal details, including work and education
- not hindered by the absence of auditory or visual cues - comfortable communicating primarily via text
- self-motivated and self-disciplined
- willingness to commit significant time to studies on a regular (weekly) basis, and accept online isn't a soft, easy route.
- can and does work collaboratively with fellow learners
- are or can become critical thinkers.
- has the ability to reflect

Palloff & Pratt qualify this by stating that it does represent the 'ideal' online student, and that those who don't possess each and every characteristic can still succeed. This suggests that being able to foster these characteristics in students, however, could increase the success rate during an online course.

These traits are very useful to consider, although the development of many may not be possible within a short-course format like BSL. This advice can be taken into account, however, by describing these attributes within course descriptions. If students are more aware of the ideal requirements, then they may be more likely to exhibit them. Number 5, in particular, is important to this project, as BSL requires even more commitment to a schedule than standard online learning. Furthermore, it is certainly not an easy option in learning the topics it covers. In including activities and discussions alongside text and video material, the courses require a great deal more focus than a simple video course.

Now that the individual learner has been considered, how do they work as a group in the online context?

2.3.3 Virtual Learning Communities

Communities of practice, in a general sense, have been discussed earlier, but now they will be explored in the context of an online environment. This will situate the concept within the particular context of BSL.

While many learning communities continue to be developed in face to face contexts, online networking tools are increasingly being used to foster learning networks. One reason for this is that they are very effective at facilitating Lave and Wenger's 'legitimate peripheral participation' (Gray & Smyth, 2011). This is due to the ease of anonymous observation and vicarious learning afforded by online networks, which then shifts to increasing participation over time.

Within these communities, and learning environments in general, three kinds of online interaction have been identified: learner-content, learner-learner, learner-instructor (Moore, 1989). Each of these interactions contribute to learning in some way. In practice, however, none of the three modes of interaction function independently. The 'community of enquiry' model of online learning (Garrison, Anderson & Archer, 1999) is a useful way to model the relationships between these interactions. The community of enquiry model outlines three elements of presence within a community: social presence, teaching presence and cognitive presence. Swan (2003) equates these to learner-learner, learner-teacher and learner-content respectively. She qualifies this, however, by stating that teachers can also have social presence, students sometimes teach and that learning, even if through interaction, is always of content.

Within BSL, a community of enquiry will be fostered by implementing all three elements of presence. Students will be encouraged to interact with each other

through discussion based tasks, while teaching presence will be built through the supportive facilitation mentioned in Section 2.2.1. Finally, content is provided within every daily activity, and interaction with that content is required, therefore cognitive presence is created.

In considering how to make an effective learning community, Jenny Preece (Preece, 2000) models them around three parts: people, purpose and policies. The people are involved to meet their own needs, or perform a desired role. The purpose is something that they share - either a need or an interest. The policies govern exchange and collaboration, from simple assumptions to set protocols for interaction. All three elements interact within a digital platform to determine the sociability of any given online community. Preece considers sociability the human interaction equivalent of usability. Where usability determines how easy it is to interact with a digital system, sociability determines how easy it is to interact with a community.

Within BSL, sociability is of particular importance due to the short nature of the courses. In order for a learning community to be useful within this context, it must be immediately easy to interact with, i.e. Sociability must be high. This means aligning the people involved, ensuring the purpose of the course is clear, and implementing policies that facilitate pain-free participation and interaction.

Once an online learning community has been established and sociability has been fostered, the next step is encouraging the learning itself. In this respect, an online community geared towards learning is unique in two key ways: collaborative learning, and reflective practice (Palloff & Pratt, 2003). The transformative learning that results from both of these elements is, according to Palloff and Pratt, what separates a learning community from a standard online community.

Palloff and Pratt (2003) define a checklist for determining whether community has formed and has become an integral part of the course:

- Active interaction, involving both course content and personal communication.
- Collaborative learning, shown through a large proportion of student-student interactions relative to student-teacher.
- Socially constructed meaning - questioning and agreement on issues of meaning can evidence this.
- Student-student sharing of resources
- The sharing of support and encouragement between students
- Willingness to evaluate the work of others.

In a similar vein to the work of Preece above, Palloff and Pratt's guidelines, stated here, will be a useful measure in later evaluations of BSL learning communities, and they value they bring to the format.

This work intends to assess the effectiveness of an academic community of practice in particular. Virtual networks of this sort have already been extensively explored in the wider education sector, trialled as methods for developing teaching practice (Sherer, Shea & Kristensen, 2003). These networks have generally been developed to provide long-term support and development for participants, and so it will be interesting to test whether a learning community is still a valuable tool within a short course such as BSL. This is one question which hangs around the use of community within this format. Legitimate peripheral participation is credited with moving learners from novice to expert 'over time,' but the time required is not set in stone. It is unlikely that a strong community could be formed within one or two weeks, the timescales of a typical BSL course, but some benefits of community and social

learning may still apply. Furthermore, there may be some contexts of BSL which benefit more from this element of the format. For example, a series of BSL courses may be used in sequence to teach a larger subject, and therefore community building can be continued over a longer period of time. This will be explored during the theory building and experimental elements of the thesis.

This finalises the exploration of the elements that comprise an online learning environment: namely the structure, the student and the community. Next, it will be considered how that environment can be measured. For that, first, engagement must be revisited, but this time in the context of online.

2.3.4 Online Engagement

Reaching back to Section 2.2.1 on engaged learning, it was shown that engagement, and learning, stems from interaction with teachers, peers and content. As previously discussed, engaged learning and constructivism can be considered one and the same (Piaget, 1969) and both are evidenced, similarly, by interactions. These interactions were outlined in the previous section, and consist of learner-learner, learner-teacher and learner-content (Moore, 1989).

Based on the above findings, this work takes the view that engagement in an online sense may then be measured by a user's interactions with learners, teachers and content. Increasing instances of each interaction equates to growing engagement, and, thus, increased learning. So, to measure engagement, systems must be put in place which can analyse the interactions conducted by learners within online learning environments.

The field of learning analytics considers how best to collect and analyse data on learners with the aim of improving both learning and the environment in which it

occurs (Siemens, Gasevic, Haythornthwaite, Dawson, Shum, Ferguson, Duval, Verbert & Baker, 2011). Learner data manifests itself in the trail left by interactions with other learners, with tutors, with content and with general online systems.

Learning analytics processes will be utilised heavily by this research to monitor learners' interactions throughout short-form courses. These measurements will be crucial in measuring engagement and attrition, and evaluating the efficacy of various online instructional methods.

Within BSL, learner interactions with material are extensively logged by the Moodle platform. This consumption activity consists of the viewing of pages, videos and discussion postings. Learner interactions with each other and with tutors are also logged, and may be termed contribution activity. These take the form of discussion postings. These measures of consumption and contribution will form the basis for the quantitative analysis carried out within this work.

Online engagement is the core measure of this work as evidenced within the research questions outlined in Section 1.4. The aim of increasing engagement, however, is directly tied to the concept of retention and attrition in online education, therefore this will be explored next.

2.3.5 Online Learning Retention

Retention and attrition are key concepts to this research. The general retention problems associated with online learning, and evidence found for this within BSL, were one of the early motivations in beginning this work. While online engagement itself is much deeper than retention, retention is evidenced by online engagement. Retention may be a valuable early measure which then leads to deeper work into

increasing online engagement. But first, the area of online retention will be more fully explored.

When exploring attrition rates within online learning, as might be expected, they seem to vary greatly by course. They have been reported as high as 80% in some areas (Flood, 2002) and Carr (2000) states that attrition will generally be around 10% to 20% higher in online learning as compared to traditional methods. Suffice to say, general agreement holds that distance education in general has increased retention problems over traditional methods. David Diaz (2002) would argue, however, that this isn't an indicator of low quality materials or teaching. In fact, online students often outperform traditional students when performance is judged on what percentage achieve a C grade or above, or when you look at student satisfaction levels. So, it seems that retention problems stem from the nature of online learning, or the nature of the online learner, rather than the general quality of learning materials. This suggests that new approaches need to be formulated to help average virtual learners to succeed more often in online learning. This is another reason that online teaching methods geared towards the aim of engagement, such as BSL, are worth testing and developing.

Salmon (2004) suggests a number of methods for increasing retention in an online course. Foremost of these is the principle of allowing a student to build their online identity through activity in the early stages. These activities, named e-tivities by Salmon, help to develop a learning community and set norms and rules around online interactions, all of which eases a student into online learning. One of her principles is to simplify options in the early stages, releasing new activities as skills are developed. This is one principle that helped to inform the BSL approach, which

aims to offer tasks day-by-day, building skills in sequence. Tasks within BSL are also kept very standard, following Salmon's guidance around establishing norms which facilitate growing interactions.

Palloff and Pratt (2003) agree with Salmon's community building concept, arguing that there is a feeling that 'we are all in this together' which reduces isolation and makes completion more likely. There seems to be little evidence behind this claim however, and recent research into the effect of community on retention is not wide ranging. One study was conducted in the 90s by Cheng, Lehman and Armstrong and it found that students in collaborative environments tended to have much lower attrition rates than those working alone (Cheng, Lehman & Armstrong, 1991). The difference shown during their study was significant; 90% completing the collaborative endeavour and 22% completing the solo version.

Another factor that Palloff and Pratt (2003) claim may affect retention is that of group size. They state that larger group sizes cause problems as students feel lost in the crowd, and tutor responsiveness drops due to the increased workload. Again, research into the effects of online community size on retention is slim, so no clear conclusions can be drawn. Many claim that the massive cohort sizes within MOOCs are a factor in the very low completion rates found there, but solid research into this has not been done. These factors together, however, have informed the development of BSL, and caused the author to keep class sizes relatively small. This is with the intention of building learning community within each cohort, and drawing from the benefits described within Sections 2.2.2 and 2.3.4.

As has been discussed, the work on retention and attrition found within this section directly informed the development of BSL, which is designed to combat the

increased attrition found within online learning. BSL is an emerging online learning format, one of a range which can be used in this context. Before continuing, the next section will explore these formats and the relative benefits of each.

2.3.6 Delivering Online Learning

In advance of exploring the emerging methods for online learning, it is worth considering its ancestor: "traditional learning". Traditional learning may be found in the form of purely face to face, blended or fully online programmes. These often cover relatively long time periods, such as a semester, a year or even a four year degree course. Material on these courses can be delivered in a variety of ways, but often the smallest chunk of learning is termed a Unit, which may run for one or more weeks. These Units will cover many hours of material and tasks. For example, a standard UK 20 credit course can include around 12 hours of learning materials and activity per week.

Moving to fully online course formats out with the traditional educational sphere, one course type which can be delivered by traditional institutions but employing emerging, innovative methods is the MOOC (Massive Open Online Course). MOOCs are open to any participant, regardless of location, and are generally free of charge. MOOCs run over multiple weeks, commonly from 4 to 12, although outliers to this do exist. MOOCs also generally propose a time commitment of anything from 4 to 12 hours per week. Therefore, while MOOCs are most often a lower time commitment than a 20 credit UK FE/HE module, they still require a substantial investment of time.

Within MOOCs, as with traditional learning, community, cohort and interaction are often very important. Group activity is common and peer to peer support is normally encouraged. This is particularly important within the MOOC format where very large

participant numbers make it impossible for tutors to support every student individually. Interactive learning is prevalent and all the engagement benefits of this, discussed in Section 2.2.1, are present.

It is worth exploring the two normal forms of MOOCs in some detail, although a full exploration of the format is out with the scope of this work. MOOCs can normally be placed into one of two categories: xMOOCs and cMOOCs. The distinction is mostly found in the choice of platform, and the amount of direction offered by the tutors.

XMOOCs are the most numerous currently, and follow the more traditional teaching model. They are categorised as MOOCs which are delivered using one dedicated platform, concentrate on high quality transmitted information, run formal assessments during a course and often automate many transactions between student and platform, assessment for example (Bates, 2015). XMOOCs, in many ways, imitate the form and function of a traditional university course.

CMOOCs, on the other hand, are designed to be much more student led, with little or no formal assessment (Bates, 2015). Even more uniquely, cMOOCs often have little in the way of formal curriculum, encouraging, if not relying on, student autonomy, and the contribution of a great deal of student generated content (Downes, 2014). CMOOCs may have no formally assigned instructor, instead appointing guest tutors who will guide discussions and activities. CMOOCs will also run over many distributed and open platforms, such as blogs, wikis and social media.

The form of BSL most closely resembles the xMOOC approach. BSL runs from one platform, offering a set curriculum and some informal assessment. Student contributions and interaction are encouraged, but the format is much more directed than that which would be advocated within a cMOOC approach. The author believes

that this is a valid approach in short-form, work based learning. WBLs aim to have a skills gap addressed, or have practical knowledge imparted, and possibly in a just-in-time fashion. Therefore the more open, exploratory cMOOC approach would require too much time, and offer too little practical gains in most cases.

Moving away from cohort based education, there are an increasing number of independent course providers which provide self-study courses. These providers include two general varieties: 1. Membership sites where all learning materials are provided by one organisation and are available to all members for a monthly price. Examples of this are Lynda.com and Fizzle.co. 2. True marketplaces where anyone can create and sell their own courses. Examples of this include Udemy.com and Fedora.com.

Courses found within these forums are almost exclusively self-study, although sometimes communities are fostered within the forum, but out with individual courses. The courses will vary greatly in length, but many are short, flexible and entirely on demand. Almost exclusively these are consumption-only courses, with little to no interaction. Learning is carried out through reading materials and video tutorials only, therefore they don't follow the engaged learning philosophy advocated within this work. As already evidenced within the engaged learning literature, action and context are important methods for fostering learning, and therefore didactic self-study methods such as the ones found within Udemy or Lynda are likely to engender less engagement, and less course success as a result.

2.3.7 Bite Sized Learning

Bite Sized Learning (BSL) as a format which takes elements from each of the categories in the previous section, aiming to create an advantageous mix. BSL aims

to be short, focussed and flexible, but it also aims to benefit from the advantages of cohort based and interactive learning.

BSL is a term which has been applied loosely to a number of methods of teaching, but a definition of BSL in the context of this work was provided in Section 1.2. It is worth, therefore, exploring the origins of this type of bite sized learning, and the contexts in which the method has been used.

BSL originated within the Public Library of Charlotte & Mecklenburg County, and a course developed by Helene Blowers (Blowers, 2006). The course was called 23 Things and was inspired by a social networking site called 43Things.com which allowed users to track 'things' that they wanted to achieve over a given timescale. The 23 Things course was created as a series of activities involving Web2.0 technologies and their application as tools for learning. Staff within the library would work through the interactive series of activities, developing their learning technology skills throughout. The method of participation within this course took the form of blogging, each participant creating their own blog to record outcomes and reflection.

In terms of format, the original 23 Things ran over three months and two or three 'things' were released each week. This format was established "so that staff already burdened with busy work schedules wouldn't feel overwhelmed by having too many discovery exercises to complete in a week," (Blowers, 2006). Staff were encouraged to work through the material each week, but concrete deadlines were not set, nor time estimates given for each individual 'thing'.

The 23 Things format has been used in its existing form by a range of libraries worldwide, first taking place in the UK via the 23 Things Oxford programme (Wilkinson, 2009). The Oxford programme encouraged a social aspect to the activity,

listing the blogs of every participant to allow commenting and discussion within those platforms. Oxford also ran drop-in sessions to allow staff face-to-face support at certain times of the week, while the course was in progress.

The 23 Things programme format has been re-used out with the original library context. For example, 23 Things for Research was also delivered at Oxford (Bodleian Libraries, 2012), inspired by the 23 Things Oxford course. This course provided lessons around 23 pieces of technology which were intended to help researchers within their work.

Other examples of BSL have emerged in the past 3 years, cutting down the number of elements to a shorter course length. One example of this evolution is the Ten Days of Twitter programme delivered by Helen Webster (Webster, 2013). Ten Days of Twitter is more similar in format to the BSL delivered within this work in that it intends to teach one themed skill using a series of broken down lessons. The aim of Ten Days of Twitter is to help learning developers use twitter within their work to enhance both their own professional development, and to develop their teaching methods. Social interaction is encouraged within this course through the medium of twitter itself, as well as via blog comments, as in the 23 Things Oxford programme.

A final iteration of BSL of note comes in the form of BYOD4L, or Bring Your Own Device for Learning. This programme was delivered by a collaboration of institutions, led by Chrissi Nerantzi and Sue Beckingham (Nerantzi & Beckingham, 2014). The programme was design to be truly open, lacking even a requirement for registration and available through Creative Commons licensing for re-use. Students could take part entirely flexibly, at any time, but the programme was also delivered in a daily format at certain times of the year. These facilitated versions ran over 5 days, and

were intended to take between 1 hour and 3 hours to complete. Social interaction took place within defined Facebook and Google+ communities, and were an integral part of the course.

These examples of bite sized learning show an evolution of the method. In the beginning, the course took the form of a list of activities, loosely related, and intended only to offer a sequence of learning which would expand the skills of library staff. Social interaction was possible but not necessarily an integral part of the process, therefore it wasn't taken up a great deal. Furthermore, time estimates were not provided for tasks and there was no real focus to the programme in terms of overall learning objectives.

By the time Oxford University took on the 23 Things format, the social elements were more heavily encouraged, but otherwise the format remained largely the same. Challenges were already being identified at this stage, and a team from the University of Limerick reported that the, "completion rate is low," (McCaffrey, Reilly, & Feighan, 2010). It has been reported already within this Chapter that online learning suffers from low retention rates, but it is likely that the 23 Things format exacerbated this through a number of factors. The first of these is the lack of clarity and coherence that no doubt took place due to the presence of 23 separate learning objectives. The course length, and the presence of 23 individual lessons, does not lend itself to the focussed, objective based learning which best suits adults learners, as discussed earlier in this chapter.

Blowers stated overtly that the course was designed to work around busy schedules, offering only 3 activities per week, but this led to a relatively long course length which is likely to put off certain learners. It is likely that concerns such as these led to the

more recent iterations of BSL in the form of BYOD4L and Ten Days of Twitter. The former course was designed to last one week only, and the latter spanned two weeks. Both, too, had a very solid focus to their teaching, rather than just aimed to develop technology skills, as was stated by the original 23 Things. The approach of these latter iterations of BSL is much more similar to that modelled within this work than the original 23 Things. As was stated within section 1.2, this author's BSL courses are as short as possible, only 1 or 2 weeks, and focus on very definite learning objectives.

Finally, within this section, it is worth commenting on the evolution of social interaction within the format. This is very clear when looking at the two most recent iterations of BSL. Within the original 23 Things, interaction was sparse, and was spread across the blog comments of every participant. This is not conducive to developing community or even conversation due to the dispersed nature of the interactions. Within Ten Days of Twitter and BYOD4L, however, community was formed within a set environment, such as Twitter or Facebook. This environment of collected interactions is much more likely to foster community than distributed communication and is the type of activity that is modelled within this work.

2.3.8 The Structure of Online Learning

Now that delivery philosophy and format have been discussed, another area relevant to this work is that of delivery method or structure. It has already been discussed in Section 2.3.5 that one method for increasing retention is to provide some structure for activity, releasing materials and tasks as skills are acquired (Salmon, 2004). Additionally, it was discussed in Section 2.2.5 that constructive alignment is most effective when learning outcomes are simple and few. A combination of these

concepts suggest that short tasks, delivered on a regular schedule could provide effective retention benefits.

This effect was suggested by the previously mentioned work by Bodie, Powers and Fitch-Hauser (2006) when they reported that short, daily tasks were effective in skills development. They teach small chunks of related information in a sequence, employing "relational chunking" and helping to improve competence in certain areas. This seems to lend further credence to the idea of holding back material, delivering it on a regular schedule over time. This method of delivery can be termed the 'drip-fed format' and will sometimes be referred to as the daily delivery format within this work.

The main alternative to the drip-fed format is the buffet model of course delivery (Twigg, 2003). The buffet format offers all course materials to the learner from the very beginning of the course. This allows full choice to the learner in when and how they interact with material, thus allowing the learner to draw from the buffet of learning as they choose.

Now that learning formats have been explored in general, one area will be explored in detail: MOOCs, and measuring engagement.

2.3.9 Measuring Engagement in MOOCs

MOOCs as a format were explored within the previous section, but it is valuable to explore the measurement of success within this format further. This is because the MOOC format, and the xMOOC approach in particular, seems to parallel the form of BSL most closely. A full exploration of the literature on MOOCs is out with the scope of this project due to the different approaches and cohort sizes involved, but there are many similarities in how success may be measured. Of particular relevance to this project is recent research into the measurement of engagement in online open

courses, something which is markedly different to the measurement of engagement in traditional learning.

One such study is that carried out by Kizilcec, Piech and Schneider (2013) in which they investigate new categories of engagement particular to open courses. They are defined as follows:

- Completing - completing all or most assessments within the course.
- Auditing - viewing video material within the course.
- Disengaging - completing assessments early, but discontinue later in the course.
- Sampling - viewing video materials during at least 2 assessment periods.

These measures of engagement were found to produce actionable results in measuring the success of MOOCs and are thought to be equally relevant to small open courses such as BSL.

A related approach to this measurement has been proposed by Arti Ramesh and a number of colleagues (Ramesh, Goldwasser, Huang, Daume III & Getoor, 2014). They similarly advocate categorising students into relatively simple categories, each of which map closely to those of Kizilcec et al. They are as follows:

- Active Engagement - contributing to discussions, submitting quizzes and assessments
- Passive Engagement - viewing material, subscribing to material and voting on material
- Disengaged - showing significant decrease in participation, or discussion postings demonstrate disengagement

In many ways, the categorisations and the method for categorising is similar to that carried out by Kizilcec et al. (2013): the course is broken into time periods and actions and views are all counted and attributed to a certain type of engagement. The unique element of this work, however, is that Ramesh et al. (2014) factor language into their measure of engagement, therefore all discussion postings are not counted equally. Some may indicate disengagement, such as discussion around a bad grade, or uncertainty in marking criteria.

This linguistic factor is a small part of a larger measurement of engagement, and the examples provided by Ramesh et al. (2014) seem to focus heavily on post-assessment discussion and complaints. For this reason, it is felt that this model is not suitable for the BSL context. Added to this is the consideration that in a short course context, and with smaller cohorts, discussion is less voluminous and more influenced by the tutor. For this reason, an analysis of the content of discussion may not be as valuable in a larger, more student-led discussion. Furthermore, discussions are encouraged as an assessment measure within BSL, rather than a social activity, and therefore the content may be less prone to opinion and therefore valuable insights.

The work by Kizilcec is, conversely, very closely related to BSL in terms of structure and is felt to be the most directly applicable, therefore it will be modelled when the time comes to test engagement measures within this context.

This concludes the underpinning research in online learning which has informed the development of this work. The finish this exploration of the literature, a number of other areas of research will be covered in brief which relate to the BSL format.

2.4 Work Based Learning

Moving on from virtual learning, another sub-set of education which is core to this study is the area of work based learning (WBL). The research questions stated in Section 1.4 outline the fact that this study aims to develop more effective online work based learning methods. Therefore, within this work, WBL is a sub-set of virtual learning. To gain the full background, however, it is worth exploring the wider WBL literature before narrowing it down to online WBL in particular.

Work based learning involves acquiring new knowledge and skills by directly applying learning to work-based problems and issues (Gray, 2001). Gray summarises this as the three following processes - learning *for* work, learning *at* work and learning *through* work - and states that it has formed a significant element of professional development and lifelong learning in the past. Brennan (2005) makes the argument that work based learning cannot have a clear definition, and that it includes any type of learning that occurs in the workplace, as opposed to the campus. This author believes that Gray's definitions are more accurate, as many work based learning engagements may take place outside of the workplace, but take the form of learning *for* work. In the particular context of BSL, many participants took part in courses from home in the evenings and weekends, but this certainly still took the form of work based learning.

Raelin (2000) goes on to provide a distinction between work based learning and more traditional learning methods. Firstly, work based learning is especially based on reflection, not simple knowledge acquisition. Skills must be learned, applied to work and reflected upon within the context of the learner's own working environment. Secondly, work based learning is conducted through problem solving in real, live

working situations. Information is given, and skills taught, but the learning occurs when that information is then applied in the learner's workplace.

The process of WBL has been found to be more arduous than traditional education, mainly due to the circumstances defining the lives of common WBLs. For example, busyness is a common thread, WBLs invariably complaining about being very 'time poor' (Nie, Armellini, Witthaus, & Barklamb, 2011). The demands present in the lives of WBLs are often far greater than those experienced by traditional learners. Other common threads found by Nie et al. (2011) are frequent travel and the desire for more mobile, flexible learning. The latter is generally thought, by the learners, to enable participation in learning despite hectic schedules. This flexibility has become a key requirement of WBL (Brennan, 2005), allowing true any-time, any-place learning which can adapt to the learners themselves.

The BSL format has been designed to meet the needs of WBLs very closely. Firstly, take Raelin's definitions of work based learning as a template. Bite sized learning is based around delivering short chunks of learning. These chunks are then consolidated by an interactive task which requires the learner to apply that knowledge to a real-world situation. Reflection is then conducted on that experience within a learning community, the discussion that takes place there forming a key part of each daily task. This, as a whole, closely follows Raelin's definitions of the style.

Next, Brennan (2005) and Nie et al. (2011) state a strong requirement for flexibility thanks to the time-poor nature of WBLs, and their ever changing location. Bite Sized Learning is designed to be very flexible, allowing access at any time and from any place.

These attributes, taken together, should provide for a learning design well suited to WBLs, and encouraging engagement between them and the coursework. The testing of this proposition is at the core of this investigation.

In this section the concepts of short tasks, mobile and flexible learning were covered. These have already been linked to BSL, going some way to justify the initial learning design. The next section will support this by covering another theory which informed the development of the method.

2.5 Just in Time Learning

Just in time learning (Simkins & Maier, 2009) encourages resources which are short, focussed and meet very targeted outcomes. This material can be accessed just as it is needed, to serve an immediate goal, as opposed to studied in advance, just in case it is needed in future. This produces more effective results for two reasons: 1. Materials are fresh in the learner's mind when they are being applied, therefore they are more likely to be accurately applied and remembered in future. 2. The need for learning and the relevance for that learning in the participant's life is high right at that moment. Therefore the motivation to learn and the learner's engagement with that learning is likely to be greatly increased. This latter point heavily supports Piaget's work around connecting the learner with their learning (Piaget, 1969), and Knowles' Theory of Andragogy: both state that adult learners are more in need for purpose and intention in their learning than children (Knowles, 2011).

BSL is longer in timescale than a normal just in time learning course, which may take the form of nothing more than a 2 minute video. But the subjects that BSL is applied to within this project require a certain length of time to cover. One week remains a short, focussed chunk of learning which can be completed just in advance of having

to use Cloud Technologies in an education context, for example, or in having to update a Moodle module (courses described in Chapters 4 and 5). Therefore, the BSL format draws from the theory of just in time learning to further underpin its effectiveness. Furthermore, BSL is chunked into daily tasks of around 30 minutes. These are built on the just-in-time learning principles, being easy to access, short in length, and immediately applicable. They are always available to the learner following the class, also, for future just in time "revision".

2.6 Attention & the Length of a Bite

Finally, BSL has been developed with research around human attention spans in mind. To begin, Robert Pike's 90/20/8 rule (Pike, 1994) is one of the most widely used conventions with regards the organisation of learning and training materials. This rule states that units of learning should:

- take no longer than 90 minutes to complete without a break
- be chunked into related segments of content no more than 20 minutes in length
- include interaction every 8 minutes

There is a lack of robust research to support Pike's rule, and it is based more on personal experience and anecdotal evidence than anything else. The approach has stood the test of time, however, having been re-communicated by many trainers in the two decades since, and used in a great deal of contexts. This continued use does lend it some credibility.

An alternative view, which marginally overlaps with Pike's approach, is advocated by Buzan (1991) within his work on the brain itself. His evidence shows that learning

and recall decreases over time throughout a learning intervention, but that recall remains much higher when breaks are included. Buzan's recommendation is to run learning periods of between 20 and 50 minutes (Buzan, 1991, p61). He states that shorter periods may not give the brain time to absorb how the material ties together, and longer periods result in a continuing decline in recall of the material. This work seems to offer valuable guidance in terms of advocating breaks within learning interventions, but the time period does cover a very wide span, perhaps not offering the most useful metrics within today's educational context of one hour lectures. The principle remains relevant, however, in that breaks should be offered on a regular basis to maintain attention and recall.

An earlier work on attention comes from Chemistry education, where students were found to remain attentive to the material for no more than 15 to 20 minutes (Johnstone & Percival, 1976 cited in Booth, 2007). This was followed by an empirical study carried out in a similar context by Burns (1985). He found that recall was greatest over the initial 5 minute period, and declined but remained relatively steady for the next 10 minutes. Recall dropped to its lowest level, however, during the 15 to 20 minute period.

Overall, the research shows strong evidence towards the fact that attention and recall decreases over time during a continuous didactic learning episode. Breaks should be introduced periodically to restore attention, and these breaks may include purposeful breaks, including discussion tasks and student interaction breaks, or they may be free from any educational purpose (Svinicki & McKeachie, 2011, p65).

This research supports the length and form of the bite-sized chunks of learning from which BSL is constructed. The natural question related to the format might be, 'What

is a bite?’ In the current definition of BSL (Section 1.2), the author states that a bite is around 30 minutes in length. Then, in Section 2.2.5 the concept of learning outcomes was discussed. Outcomes were discussed in relation to the constructive alignment that is present when a task tackles just one learning outcome, aligning all coursework and activity to achieving that outcome. That is how a ‘bite’ is defined, ideally, within the context of this work: a segment of learning which tackles one learning outcome, in which information, activity and assessment are constructively aligned, and which can be completed in a certain time period.

In order to justify this definition, the format of the precursors will be explored, and the evidence presented around attention spans will be employed. The original 23 Things course, discussed in Section 2.3.7, contained activities that are very similar in scale to the author’s version of BSL. One task was offered within each ‘thing’ as well as a set of very short learning materials. No time estimates were offered, but they mostly seem to conform to a 30-60 minute timescale. This follows very closely the form advocated by Buzan (1991, p61) within his work.

Ten days of Twitter, again, follows a very similar scale. Each task is very short, focussed, and constructively aligned. Many of these tasks could be completed in less than 30 minutes, and require no more than 10 minutes of ‘information transmission’ and the remainder spent in activity. This, again, follows the guidance offered by the research presented above, and, in fact, keeps information transmission normally within that 15 minute window advocated by both Johnstone & Percival (cited in Booth, 2007) and Burns (1985).

As defined in Figure 1, a daily chunk within BSL should be short: around 30 minutes long. This is well within the 20 to 50 minute window advocated by Buzan. Further,

within that chunk, materials are designed so that there are at least two segments of transmitted material, no more than 15 minutes long individually. In addition, the 30 minute lesson will include a practical activity which requires action and discussion. This means that information transmission always falls within Burns' 15 minute window, and often meeting the 8 minute interaction limit advised by Pike. One issue here is Buzan's claim that material should not be shorter than 20 minutes long. This is mitigated by the fact that bites are generally 30 minutes long, and broken up by purposeful activity. Therefore 5 to 15 minute sections of learning, broken by educational tasks or discussion, form a smaller part of a larger whole. This means that the coherence of the material is maintained, allowing learners to consume 30-plus minutes of learning in smaller chunks, but maintain the linkages between each chunk. It is advisable, however, to keep the overall length of a bite below Buzan's 50 minute limit, and preferably shorter if possible.

The 8 minute interaction limit is the only rule which is occasionally broken.

Introducing interaction within a fully online, asynchronous learning context is difficult at times. Discussion tasks are used as much as possible, but the inclusion of video is used as a substitute sometimes in order to offer variety and the perception of interaction with others. The varying of delivery style has been shown to improve attention (Svinicki & McKeachie, 2011, p65).

The theories that underpin this work have now been covered, and a justification has been presented for the initial form of BSL. The final element is to discuss how the success of this format will be assessed.

2.7 Linking Involvement, Engagement and Learning

The general area of student engagement was covered in Section 2.2.1, and this was narrowed down to online engagement within Section 2.3.4. Now it is worth covering the ways that engagement will be used within this study, and particularly how the concept will be used to measure the success of the BSL format. The particular areas of interest here are how involvement, as measured by learning analytics, relates to engagement, and how that engagement relates to learning.

Involvement was defined first by Alexander Astin as "the amount of physical and psychological energy that the student devotes to academic experience." (Astin, 1984, p297) His concept of involvement refers to the activity carried out by a student, discounting thinking or feeling. He found that a student's ability to achieve their academic goals is directly related to the time and effort they invest in activities designed to achieve those aims (Astin, 1984, p301).

Building on Astin's work, involvement with purposeful educational activities has been linked to "satisfaction, persistence, academic achievement and social engagement" (Trowler, 2010). Linking this to engagement, involvement is said to differ from engagement through the dimension of 'purpose' and 'action' (Harper & Quaye, 2009, p5). When an involved student feels purpose in their learning and is moved to action, then they are engaged.

In another strand of work, Kuh, Kinzie, Buckley, Bridges & Hayek (2007, p44) state that student engagement comprises "two critical features":

- The amount of time and effort a student puts into educationally purposeful activities.

- The effort the institution puts into resources and processes that enable and encourage the student to succeed in their studies.

Kuh, et al's first feature of engagement mostly takes into account "time" and "effort".

This echoes Astin's view of involvement which is concerned with the amount of energy devoted to purposeful activity. This therefore suggests a very strong link between involvement and engagement, assuming the involvement is with educationally purposeful activities.

This leads to the search for a definition of the aforementioned "purposeful educational activity". Chickering and Gamson (1987) provide this in the form of seven categories of effective educational practises, as shown in Table 2.

According to Chickering and Gamson, and echoing Astin's claim, the more that students take part in these activities, the more they learn and the more successful they will be.

In designing BSL courses and in defining the overall approach, all of Chickering and Gamson's categories of educational practise have been taken into account and implemented. The only category which is arguably lacking is "high expectations" since it is difficult to implement this without formal assessment. Other methods are used for this, however, such as ensuring this is highlighted within course descriptions, introductions and task outlines.

Seven Categories of Effective Educational Practices

- student-faculty contact
- cooperation among students
- active learning
- prompt feedback
- time on task
- respect for diverse learning styles
- high expectations

Table 2: Chickering and Gamson's seven categories of effective educational practice (Chickering & Gamson, 1987).

Because BSL is constructed from purposeful educational activities the research above suggests that engagement can be measured, in the context of this project, by the volume of involvement a participant has with the course materials. Furthermore, due to the aforementioned links drawn between involvement, engagement and learning, this can be taken as a measure of course success, and an indicator of learning undertaken by the participants.

2.8 Conclusion

This review of the literature aims to provide a foundation and background to the work which will be presented in later chapters. The overall area of educational research has been covered, paying particular attention to the core themes of this work: engagement and evaluation. The world of online learning has also been explored, and the ways in which it is both similar and different from traditional learning. Naturally that led to a discussion on the weaknesses present in the field, and how

that relates to this work. This section also outlined the ways in which online learning is delivered today and how recent research around MOOCs can help to inform this research. Finally, work based learning was explored, along with just in time learning and research around attention and retention. This helped to provide justification for the design of bite sized learning.

This author believes that the literature clearly shows the value of this strand of research. The retention problems highlighted in Section 2.3.5 are clear, and in need of solutions. Harper and Quaye (2009, p3) state that large amounts of empirical evidence exist to suggest that strategies for increasing engagement in learning are worthwhile, and that the gains are "too robust to leave to chance." This is put even more firmly in the context of this project by the claim that this is even more worthwhile in populations where engagement is known to be problematic (Harper & Quaye, 2009, p3). As stated earlier, the two populations relevant to this project are online learners and work based learners, and both suffer from engagement issues. Therefore, it is felt that this work is timely, necessary and practical.

Another finding within the literature is the lack of research around the measurement of online engagement in open online education. Valuable work is emerging around MOOCs, as described in Section 2.3.9, but this could be greatly expanded upon, and applies to that 'massive' format only, leaving smaller courses within little evidence to draw from.

In order to provide evidence to that end, this project aims to measure the success of an emerging teaching format, and develop it based on those findings. This relies on learning analytics, and equating involvement to engagement, which can then provide an indication that greater learning is occurring. Section 2.7 provided evidence to

show that involvement, in the form of time spent on course, does equate to engagement providing the time is spent on purposeful educational activities. Therefore, the measures carried out within this project can give us a meaningful indicator of success in a course since engagement is linked strongly with success, satisfaction and learning.

To be clear, this project aims to evidence engagement only, and does not intend to measure learning. A strong link has been shown between the two, but evidencing learning from involvement alone is almost certainly not wise. Increasing engagement on its own, however, is certainly a worthwhile aim at this stage, due to its links with course success, and the measurement of learning within BSL would be a very good next step, beyond this work.

Now that the literature has been presented on the subject of study - online work based learning - the next Chapter will explore the methodology which will be followed in order to complete the work.

3. Methodology

3.1 Introduction

This thesis discusses research which was carried out to test, develop and refine an emerging online teaching format. In the process of carrying out this work, a number of research methodologies were employed which were found to be very well suited to this context. This particular combination of methodologies are effective in an iterative testing and development approach with the purpose of developing new teaching methods and theory.

Due to the iterative nature of the process, the analogy of a methodology 'Stack' has been found to be useful. This stack is detailed in Figure 2. As will be discussed, the stack begins with a foundation of Action Research. Action Research and the practice based approach it advocates informs every aspect of this work, centring on the improvement of existing, live courses delivered by the author.

Upon an Action Research foundation, grounded theory is placed. Grounded theory, in this context, is intended to facilitate the development of a generalizable theoretical model of bite sized learning (BSL). Grounded theory is utilised throughout this work in building theory around the teaching method, discovering areas of strengths and opportunities for improvement.

Finally, a layer of mixed methods research is placed on the stack. This represents the practical elements of the research, from data gathering to analysis, and is supported by and intermixed with grounded theory throughout. The mixed methods body of this work is split into 3 stages, following specific mixed methods approaches

in each instance. These stages are stacked so that each stage builds upon the one below, moving towards robust results and theory.

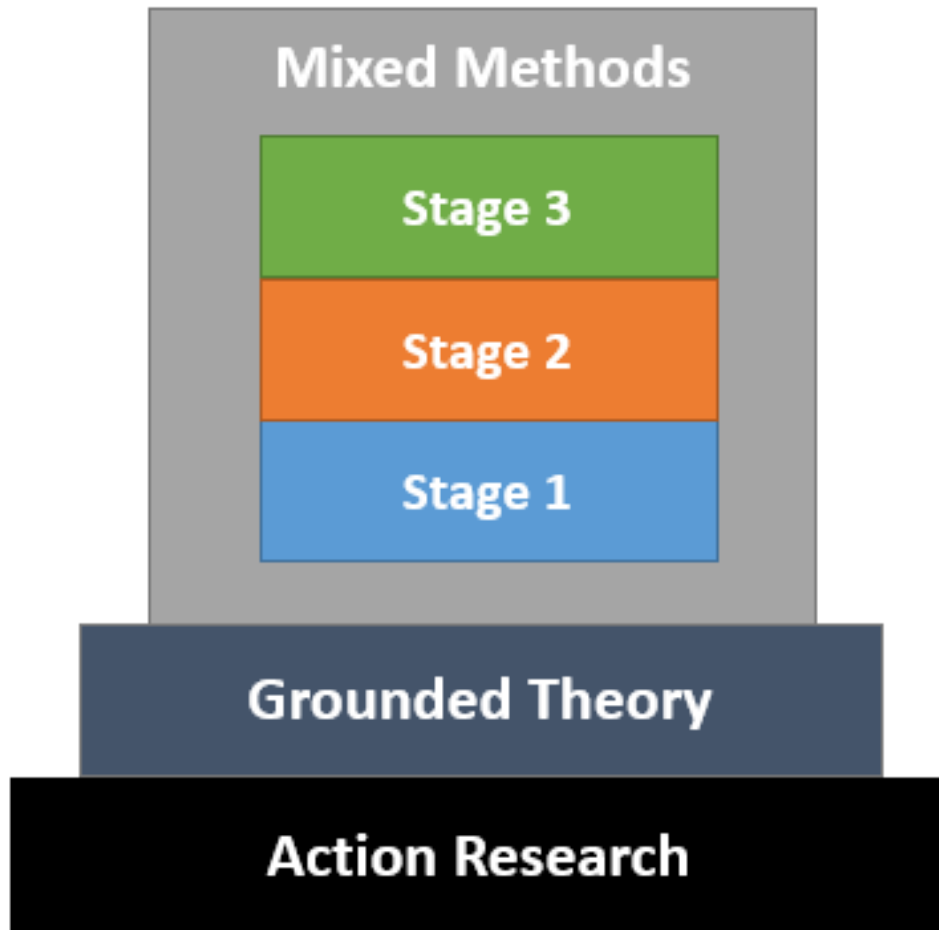


Figure 2: A visualisation of the methodology 'stack' used within this research.

This benefit of explaining this approach, and outlining the stacked methodology, is in offering a more advanced starting point for future researchers. During this work the author went through a number of cycles of methodology development, iterating the model throughout the research. An early version of this stack was published in 2014 and very valuable discussion took place around the presentation of this work (Gray, 2014). A complete picture of how the layers of methodology interact, and particularly the stages of mixed methods, became clear following this discussion and during

further research work. These, combined, led to the current form of the stack. If this model can clarify a method for researching and improving teaching methods in future, better enabling this type of research, then that would be a highly desirable outcome of this work.

The layers of the stack and how they interrelate will be discussed in detail within this Chapter. The suitability of the stack to the particular context of this research will be discussed, and it will be shown how this combination of methods helps to produce rigorous results.

3.2 Action Research

The research related in this thesis, and the methodology stack discussed, has Action Research as its foundation (Avison, Lau, Myers & Nielsen, 1999), and will employ methodologies to suit this. Action Research is an approach based strongly in practice, seeking both to explore and to inform (Wisker, 2001, p122). It is often used in attempts to solve a problem or to test a hypothesis with the intention of improving professional practice.

In practice, action research is cyclical, requiring repeated phases of planning, action, observation and reflection. The final reflections of each stage then inform the next stage of planning (Kemmis & McTaggart, 2005). The overlap this describes is clearly felt within this work, and will be explicitly outlined within Section 3.5. The three stages of research found within this research process are entirely interlinked, and so demonstrate the synergy produced by allying action research with the methods that will be described next: grounded theory and mixed methods.

3.3 Grounded Theory

Grounded theory is intended to produce a theoretical model which begins to make BSL generalizable and applicable across any learning context. Thus it is a foundation to the mixed methods body of this research. Grounded theory is theory grounded in practice and experience (Wisker, 2001, pp 187). Grounded theories are discovered during the process of researching a set of phenomena and are refined and verified through data collection and analysis around those phenomena.

Research and theory generation run in parallel and are interdependent, unlike traditional research in which theories are created and then proven (Strauss & Corbin, 1990, pp.23). The process begins with study and theories are allowed to emerge during the research process.

Grounded theory and action research work very well together thanks to the cyclical nature of the latter. The plan-test-refine process of action research facilitates the formation and refinement of theory, and seems very well suited to this project. Using experiments around ways to deliver BSL, it should be possible to develop a theoretical model of short-form or bite-sized learning for work based learners.

Grounded Theory has been indicated as an appropriate method for developing this type of model (Mehmetoglu & Altinay, 2006).

A grounded theory approach will be followed throughout Stages 1 and 3 of this work, both of which will be defined further in Section 3.4. Furthermore, the theory generated in Stage 1 will directly inform the design of the Stage 2 experiment, and thus provide a foundation for Stage 3. Therefore, grounded theory acts as a support to the mixed methods element of the stack, all of which stands upon an action research foundation.

In order to carry out the work, thematic analysis will produce initial codes, then constructed codes, then themes and finally concepts which can be transferred into a theoretical model. The refined theory which emerges from Stage 3 will be transformed into a theoretical model for BSL. This will be the core contribution to knowledge provided by this work, producing an output which will demonstrate how other educators and trainers can effectively use BSL in the context of work based learning.

3.4 Mixed Methods

Upon an Action Research foundation and a base of grounded theory, mixed methods are placed to form the body of this research. Mixed methods is a methodology that seeks to combine both qualitative and quantitative approaches, and has been coined the "third methodological movement" by Tashakkori and Teddlie (2003). Quantitative and qualitative methods make up the first and second movements respectively.

According to Creswell (2003), mixed methods probably originated in 1959 during a study carried out by Campbell and Fiske. When investigating psychological traits, they implemented multiple methods, and encouraged others to use their "multi method matrix" in future. A Mixed Methodology is thought to help in balancing out biases found in other more single-minded methods. It combines those methods, drawing the benefits of each, while shoring up weaknesses, or uncovering errors, using comparable results (Creswell, 2003). Furthermore, using mixed methods one method can be used to inform another method, helping to develop a more robust or deep investigation (Green, Caracelli & Graham, 1989, pp.260).

Finally, mixed methods are particularly useful in projects that seek to explore AND explain. Qualitative methods are well suited to the exploration of an issue, when a

research area is immature or theory is thought to be inaccurate or biased (Morse, 1991). Open questions, interviews and other qualitative approaches allow the discovery of new concepts, unknown to the researcher at the start of the project. Quantitative methods, however, excel at explaining phenomena. A narrow hypothesis is formed and experiments are designed to test that hypothesis, offering a final explanation of the results based on statistical procedures (Flick, 2011).

In linking back to Action Research, triangulation is often used within this approach (Wisker, 2001, pp.157). Triangulation is intended to add rigour to any conclusions that are drawn, and this is particularly relevant to practice based research which can necessitate smaller samples and unreliable environments. Mixed methods is a form of methodological triangulation and thus it would appear to be a suitable partner to Action Research.

Furthermore, as was suggested in Section 3.2, the cyclical or iterative nature of action research produces an effective synergy with the mixed methods approach followed within this work. As will be outlined in Section 3.5, each of the three stages of this work employ a particular mixed methods approach. These approaches interlink in an iterative fashion: Stage 1 informing stage 2, and stage 2 informing stage 3. When mixed methods are used in this way, they seem to work well with an action research approach.

3.5 The 3 Stage 'Stack'

As discussed in Section 3.1, the mixed methods body of this work takes a three-stage approach, each of which builds upon the last. These stages lead towards the development of theory. For the purposes of clarity, these stages have been given the following names:

- Teaching Format Snapshot
- Teaching Format Experiment
- Teaching Format Theory

The following diagram, Figure 3, displays a zoomed-in version of the mixed methods section of the stack, introduced in Figure 2. Figure 3 shows how the stages stack, from bottom-up, to produce educational research results.

Section 3.6 will cover, in detail, the composition of each stage within the context of BSL. However, what follows in this section is a summary of the general application of these stages. This will add clarity to the following section, and will allow the methodology stack presented here to be more easily re-used by researchers in other contexts.

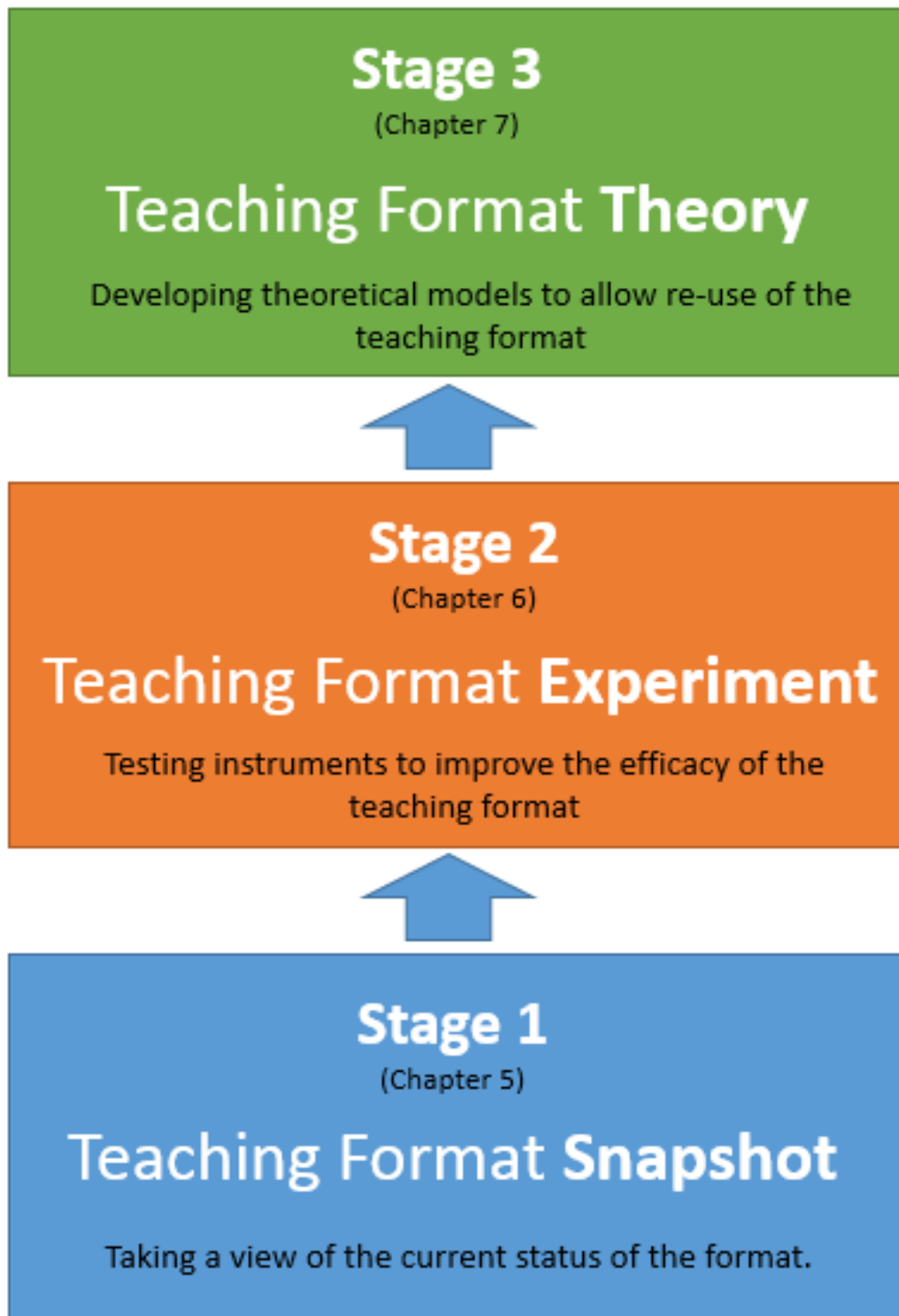


Figure 3: The research stages employed within this thesis, demonstrated as a stack.

Stage 1, the Teaching Format Snapshot, takes the form of an evaluation, determining the efficacy of the initially conceived teaching approach. This will most likely be carried out on existing teaching which may not have been designed with experimentation or testing in mind. This is intended, as the name suggests, to produce a snapshot of the current status of the learning format, including engagement trends, strengths and weaknesses. An initial theoretical model will be produced during this stage, outlining the constituents of the format and how they interrelate.

Stage 2, the Teaching Format Experiment, will build upon the results of the Teaching Format Snapshot by delivering an experiment designed to improve the teaching method, or to test elements of the theory which are uncertain. This will draw from the stage 1 theory, finding areas of weakness or uncertainty which can suggest research questions and experiments that will refine the method. The experiment will then produce quantitative results which can be analysed in order to answer the research questions proposed.

Finally, the quantitative data from the Teaching Format Experiment will be brought forward to Stage 3, the Teaching Format Theory, and will be allied with a second layer of qualitative data, sourced from the experiment participants. This will help to explain the quantitative results and move towards a theory of the teaching method in question.

Figure 3 shows the sequence of research, stacked from bottom up, and outlines the purpose of each stage. The results of stage 3, having built upon the layers of stages 1 and 2, will be used to generate a theoretical model for the teaching method. The

aim of this model is to allow easy implementation of the format by any educator in wider educational contexts.

Each stage of the stack presented here follows a mixed methods approach which is suited to the particular purpose of that stage. These approaches will be covered, in detail, within the next section, along with their place in this work.

3.6 Applying the Stack to BSL

As has been discussed, this work intends to *explore and explain* current engagement in online learners within the BSL format. Following that, the aim is to explore how to change that engagement through experimentation, and explain why that change occurs. Finally, a model is designed which demonstrates how BSL can best be employed within work based learning. This section will illustrate how the three mixed methods stages discussed previously will achieve these aims.

Teaching Format Snapshot

Stage 1 of the project, the Teaching Format Snapshot, will consist of an evaluation of the pre-existing BSL format. This intends to explain the starting point of engagement present within BSL courses and explore why these trends may have originated. The first part of this evaluation will be based on an analysis of learning analytics drawn from a base set of BSL courses. These analytics will enable an exploration of how and when users access learning materials during the course period. This quantitative data is the first stage of data collection and is termed D1, as shown in Figure 4. Next, qualitative approaches will be used to explain why these engagement patterns emerged. Surveys will source this data by delivering exploratory questions and elicit open answers from participants. This data is labelled D2 within Figure 4.

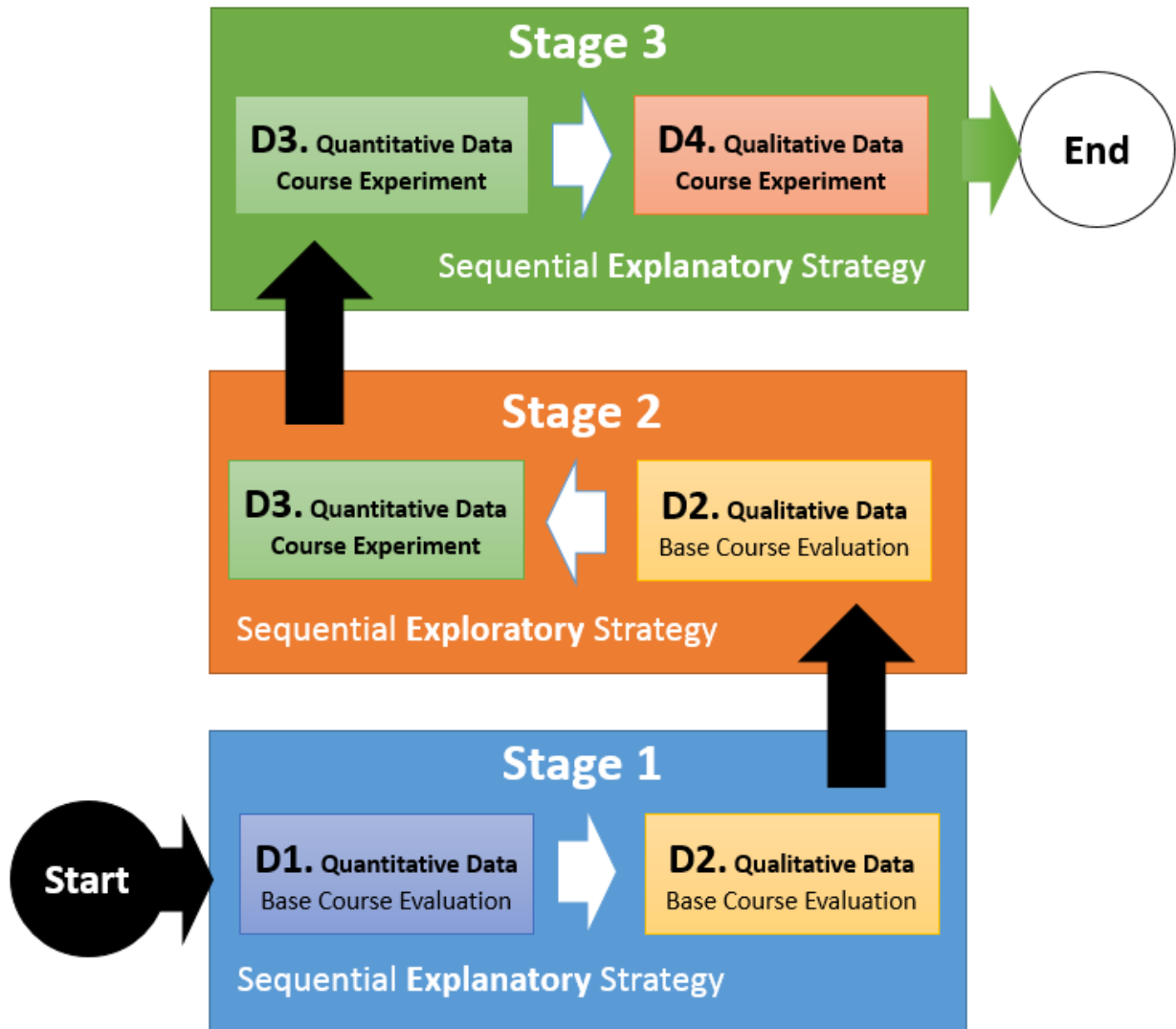


Figure 4: Stages 1 to 3 of the research methodology and the ways in which they link.

The process that makes up the Teaching Format Snapshot is an example of a sequential explanatory strategy, one of six mixed methods strategies defined by Creswell (2003). The purpose of this strategy is to use qualitative research to assist in interpreting quantitative data, and to explain any unexpected results. Since this project did not know what to expect from its initial quantitative analysis (D1), the qualitative data (D2) is essential in making sense of the analytics, and explaining current trends.

Teaching Format Experiment

To begin stage 2 of the project, the Teaching Format Experiment, the author will switch to a sequential exploratory strategy, another of the six mixed methods strategies defined by Creswell (2003). A sequential exploratory strategy starts with qualitative data, and this is used to develop a theory. Next, quantitative data is used to explore the effect of the theory in practice. Creswell (2003) states that this strategy is of great use in projects where an 'instrument' is designed. Within this Teaching Format Experiment, the author aims to develop and test an 'instrument' which may affect engagement within a BSL course, and so this strategy seems well suited.

The qualitative conclusions (D2) from Stage 1, in the form of an initial theory of BSL, will be brought forward and used to inform the Stage 2 sequential exploratory strategy. Figure 5 highlights this overlap in the use of data between stages. The initial theory of BSL will suggest strengths and weaknesses in the format, or uncover uncertainties around its components. An experiment will be designed to test whichever element of this seems most important to the development of the format, based on these theoretical outcomes. The experiment will then be run, and quantitative data will be drawn from the results to answer those questions. This data will be used to determine the change in engagement that results from the experiment. This third set of data, drawn from the course experiment, is labelled D3 for reference, as shown in Figure 4.

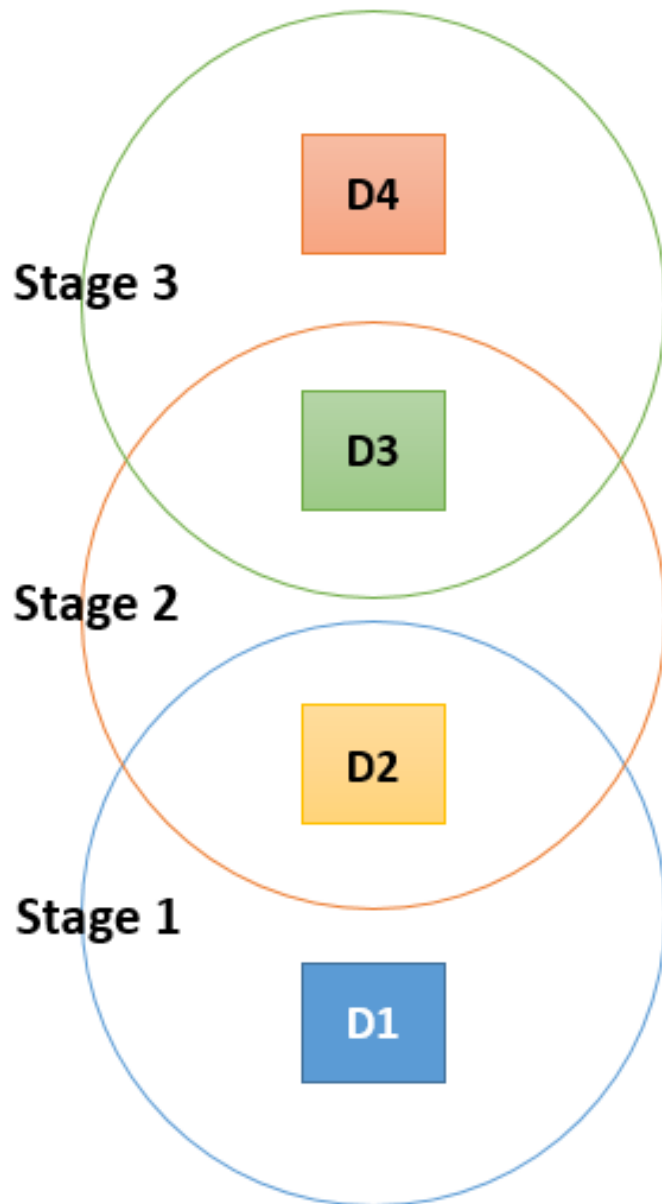


Figure 5: An outline of how data overlaps within each stage.

Teaching Format Theory

Finally, Stage 3, the Teaching Format Theory, will comprise of a further sequential explanatory strategy analysis. This will begin with the quantitative data drawn from the second half of the Teaching Format Experiment (D3), and qualitative data will be sourced from that experiment to explain these results. This fourth set of data, the

qualitative output, will be labelled D4 and will result in refinement of the theory which emerged during the Teaching Format Snapshot.

An Iterative Process

In the development and testing of a format or tool, this type of iterative approach can be very effective, and suits the cyclical nature of Action Research well. Furthermore, BSL is, by nature, short and iterative itself. This creates a very fertile ground for Action Research; experiments can be planned, implemented and reflected upon within a period of weeks. The results of these experiments can inform new instruments or adjustments to be tested in the next iteration of that course.

It is believed that this project will benefit from the positive association between action research and mixed methods. As discussed, mixed methods are central to this project due to the integration of qualitative and quantitative data. If mixed methods can produce rigorous action research through triangulation, and action research is suited to improving practice in an iterative participative fashion, then the combination seems very suited to this practice based, iterative educational research project.

3.7 Implementing Grounded Theory

At this stage, it is worth considering the methods which will be used to implement the grounded theory process that will be employed in Stages 1 and 3 of the project.

In the field of grounded theory, coding is key in generating theory from qualitative data. The method, introduced by Glaser and Strauss (Glaser & Strauss, 1967), and recently expanded by Charmaz (2006), is a very popular method for analysing qualitative research data.

In the context of grounded theory, there are a range of coding methods, each of which take a different approach to interpreting text. These are termed 'open coding', 'axial coding' and 'selective coding'. (Strauss and Corbin, 1998) These methods can be used alone, or they can be employed in tandem, the researcher choosing the most suitable for a given task and combining results to reach a research aim. Commonly a project will begin with open coding, and move towards selective coding as the analysis proceeds to conclusion (Flick, 2011).

Open coding is the opening process whereby repeated readings lead to a range of codes developed around concepts in the text. Axial coding often follows and defines the relationships that tie codes together, eventually producing a structure that defines relationships and contexts of the major categories. Finally, 'selective coding' coalesces the data so far into one category and one phenomenon that together encompass your data, and form the theory which emerges from your analysis (Strauss & Corbin, 1990, p. 131).

Thematic coding (or thematic analysis) is an alternative coding process, defined by Clarke and Braun (2006), which follows a set of clear phases to produce a category based analysis of qualitative data. There is some argument over how Thematic Analysis and Grounded Theory are related, but some argue that they are, in fact, the same process (via Tuckett, 2005):

- Phase 1: Becoming Familiar with the Data
- Phase 2: Generating Initial Codes
- Phase 3: Searching for Themes
- Phase 4: Reviewing Themes
- Phase 5: Defining and naming themes

- Phase 6: Producing the Report

As has been mentioned, this work has employed a thematic analysis approach to coding. It is felt that the thematic approach suits the iterative nature of the project very well. The phases of thematic analysis provide a good scaffold for the development of a BSL coding system in Stage 1, and this may then function as a constructed code which can be further refined into theoretical concepts in Stage 3.

3.8 Conclusion

This Chapter outlined the methodological approach which was employed to complete this work.

The proposed methodology stack builds layers of action research, grounded theory and mixed methods in sequence to produce robust research. The entire stack remains strong by drawing on the strengths of one method to mitigate the relative weaknesses of the other. It also gains coherence through the cyclical and overlapping nature of each layer, something naturally present in action research and constructed in mixed methods through complementary approaches. These complementary approaches build upon each other through the three stages of this work, all with the aim of constructing knowledge and theory throughout. This will result, by the end of this thesis, in a proposed theoretical model of BSL which may be used in helping to improve work based learning at large.

This model is, in many ways, similar to a standard cyclical action research project. This author believes the model to be innovative, however, in two ways.

Firstly, while action research is often shown as a cycle of plan, test, analyse, this illustration does not include the detail needed to actually carry out this cycle. In the

process of planning and carrying out this project, the author was required to do much work in determining an effective way to piece together a cycle which would effectively develop the learning format. This aim is something which is common within the educational community - developing and improving methods of learning - and therefore it was felt that a conceptual model would be a useful tool for other researchers in future. This model is innovative in that it offers a much more advanced and detailed starting point for future researchers who are carrying out research in this context.

Secondly, this model is innovative because it brings together both evaluation and exploration within one action research project, and it links those processes strongly together through three stages of complimentary mixed methods. Action research, to begin, is prone to taking an insular and subjective approach. By advocating a 'teaching format snapshot' which takes an picture of the current state of a learning format, this creates a robust, objective starting point for the sequence of research. This is achieved by selecting two approaches to mixed methods and stacking them in three layers, all of which are tightly interlinked. These explanatory and exploratory approaches set the scene, allow exploration, then development and finally consolidate the theory. This approach guides researchers through the process, attempting to increase the rigour of their research throughout the journey, and to result in theory which is replicable, developing the field of education.

In the next chapter this thesis will move from theory to practice, relating the first practical element of this research. This centres on defining the measures of engagement to be used, something which will underpin the quantitative elements of every stage.

4. Defining Measures of Involvement

4.1 Introduction

Within Section 2.7 the concepts of involvement and engagement were discussed, and definitions were proposed within the context of this research. This sets the basis for investigating involvement and engagement throughout this work. However, the statistical methods for measuring that involvement now need to be defined. This chapter outlines an investigation into three methods for measuring involvement within a Moodle-based course, utilising the learning analytics available to any instructor.

This investigation is based on the learning analytics data sourced from a course named "In the Cloud" (ITC). "In the Cloud" (ITC) was the first course to be delivered by the author using the BSL format and it will be described in more detail in the following section.

Within this chapter, learning analytics are sourced from ITC. The data is used to test each proposed method of measuring involvement, and the reliability of each method is reported. The chapter will conclude with a decision, based on this investigation, on which method of involvement will be used throughout the quantitative elements of this mixed methods research.

The outcomes of this chapter have been submitted to The Learner journal for publication. The work has passed peer review and will be published later in 2015.

4.2 The Subject of Study

The work based learning course under investigation within this chapter is named "In the Cloud" (ITC). ITC was run, in total, six times within the Edinburgh Napier

University professional development programme. Each run of the course will be referred to as one *instance* of the course, therefore six instances of ITC took place. These instances were delivered over 2 years, from 2012 to 2014. The course was designed to teach the principles of 'Cloud applications,' such as Google Drive, Evernote and Dropbox, and how those tools can be applied to enhance HE teaching practice and personal productivity.

The participants of this course were all Edinburgh Napier staff members, including both Academic and Support staff. Participation in this course was voluntary and participants were recruited through adverts which were sent to the entire staff complement of the university. Potential participants applied to attend the course and were then sent participation instructions 3 or 4 days prior to the start date.

The 6 instances of this course were run using the same course format each time. Content varied minimally between instances, changing only to update the material as technology changed. Each instance had a different number of participants, ranging from 7 to 18, and an average of 14.

ITC was a 5 day course, and aimed to offer a 20 minute block of activity for each day, the day's activities released on the relevant day at 10am. Each activity introduced a Cloud application, outlined the potential benefits, and set a task for the participants for that day.

4.3 Data Gathering

Each instance of ITC was run on the Moodle platform maintained by Edinburgh Napier University. This is Edinburgh Napier's main delivery platform for online

learning. Moodle logs access data for every course instance within its platform, keeping track of every resource which is accessed by students and tutors.

Access logs for ITC were extracted from Moodle and placed into Excel. Excel was used to process the data, counting the access statistics for each user and placing these statistics into a table. An example of the original unprocessed data is shown below in Figure 6 and the processed output is shown in Figure 7.

Magic Moodle G2	08/04/2014 12:02	193.61.96.229	XXXXXXXXXX	course view (http://www.tel	Make Magic with Moodle - Group 2
Magic Moodle G2	08/04/2014 11:58	134.219.68.207	XXXXXXXXXX	course view (http://www.tel	Make Magic with Moodle - Group 2
Magic Moodle G2	08/04/2014 11:57	137.108.145.21	XXXXXXXXXX	forum view discussion (http	Blocks
Magic Moodle G2	08/04/2014 11:56	137.108.145.21	XXXXXXXXXX	forum view forum (http://ww	Course Discussion Space
Magic Moodle G2	08/04/2014 11:56	128.243.253.103	XXXXXXXXXX	book view chapter (http://w	Activity 2: Activity Instructions
Magic Moodle G2	08/04/2014 11:56	137.108.145.21	XXXXXXXXXX	forum view discussion (http	Introduction
Magic Moodle G2	08/04/2014 11:56	128.243.253.103	XXXXXXXXXX	course view (http://www.tel	Make Magic with Moodle - Group 2
Magic Moodle G2	08/04/2014 11:56	193.61.96.229	XXXXXXXXXX	page view (http://www.tel	e;An Example Banner & some B
Magic Moodle G2	08/04/2014 11:56	128.243.253.103	XXXXXXXXXX	course view (http://www.tel	Make Magic with Moodle - Group 2
Magic Moodle G2	08/04/2014 11:56	193.61.96.229	XXXXXXXXXX	page view (http://www.tel	e;How Does this Course Work?
Magic Moodle G2	08/04/2014 11:56	128.243.253.117	XXXXXXXXXX	page view (http://www.tel	e;An Example Banner & some B
Magic Moodle G2	08/04/2014 11:55	134.219.68.207	XXXXXXXXXX	book view chapter (http://w	Activity 1: Icons
Magic Moodle G2	08/04/2014 11:55	128.243.253.117	XXXXXXXXXX	course view (http://www.tel	Make Magic with Moodle - Group 2
Magic Moodle G2	08/04/2014 11:55	134.219.68.207	XXXXXXXXXX	course view (http://www.tel	Make Magic with Moodle - Group 2
Magic Moodle G2	08/04/2014 11:55	134.219.68.207	XXXXXXXXXX	book view chapter (http://w	A Guide to Including Video in Mood
Magic Moodle G2	08/04/2014 11:55	134.219.68.207	XXXXXXXXXX	course view (http://www.tel	Make Magic with Moodle - Group 2
Magic Moodle G2	08/04/2014 11:55	134.219.68.207	XXXXXXXXXX	book view (http://www.tel	e;Structuring and Organising Your Mo
Magic Moodle G2	08/04/2014 11:55	134.219.68.207	XXXXXXXXXX	book view chapter (http://w	How to Structure Your Module
Magic Moodle G2	08/04/2014 11:54	134.219.68.207	XXXXXXXXXX	course view (http://www.tel	Make Magic with Moodle - Group 2
Magic Moodle G2	08/04/2014 11:54	193.61.96.229	XXXXXXXXXX	forum view discussion (http	Day 1 - Welcome!
Magic Moodle G2	08/04/2014 11:54	134.219.68.207	XXXXXXXXXX	book view (http://www.tel	e;Structuring and Organising Your Mo
Magic Moodle G2	08/04/2014 11:54	134.219.68.207	XXXXXXXXXX	book view chapter (http://w	How to Structure Your Module
Magic Moodle G2	08/04/2014 11:54	134.219.68.207	XXXXXXXXXX	course view (http://www.tel	Make Magic with Moodle - Group 2
Magic Moodle G2	08/04/2014 11:54	193.61.96.229	XXXXXXXXXX	forum view forum (http://ww	Course Discussion Space

Figure 6: A sample of one raw Moodle log imported into Excel. Participant names are blurred to protect privacy.

This access data can be split into consuming data, which is simply the viewing of course pages, and contributing data, which is posting of material to the course discussion boards. These statistics, collated for each user, were then used to create tables and charts which help to unveil the access trends present within the course. These tables and charts will be shown in the following section as the data is being analysed.

4.4 Method and Results

The first element of this investigation is to define the types of engagement to investigate. The model proposed by Kizilcec, Piech and Schneider (2013) provide starting categories and were translated into the BSL context:

- **Completing:** Contributions via discussion postings. These postings are the end result of completing a task within ITC, and the equivalent of assessment on BSL courses. One completion is defined as the posting of a message to the discussion forum. Therefore, when measuring 'completion' volume, it is possible for participants to carry out numerous 'completions' in one day.
- **Auditing:** Viewing materials within the course. One 'audit' is defined as a view of one video tutorial, text page or discussion posting. Therefore, users can make multiple audits on any given day.
- **Disengaging:** Not participating on a given day.

4.4.1 Method 1: Activity Volume

The first measure of engagement tested was activity volume. The belief behind this measure is:

The greater the volume of auditing and completing activity, the greater the engagement within that course. This means that volume of activity counts for more than number of participants.

To visualise this measure, data was collected from Moodle, as described in Section 4.3 and collated into a map of engagement throughout the week.

Date	F	P1	P2	P3	P4	P5	P6	P7
24/11/2013	0	0	0	0	0	0	0	0
25/11/2013	40	13	14	72	47	32	42	2
26/11/2013	74	34	5	40	40	11	49	0
27/11/2013	59	0	19	45	18	47	1	0
28/11/2013	147	56	30	82	0	0	0	0
29/11/2013	42	40	39	47	18	0	0	0

Figure 7: A map of auditing activity through the week by Participants 1 (P1) to 7. F represents the facilitator's activity.

Date	F	P1	P2	P3	P4	P5	P6	P7
24/11/2013	0	0	0	0	0	0	0	0
25/11/2013	2	1	2	3	2	1	2	0
26/11/2013	10	4	1	1	2	0	1	0
27/11/2013	5	0	2	2	0	5	0	0
28/11/2013	11	8	3	5	0	0	0	0
29/11/2013	6	5	8	3	1	0	0	0

Figure 8: A map of Completing activity through the week by Participants 1 (P1) to 7. F represents the facilitator's activity.

Total Auditing Activity as % of Day 1

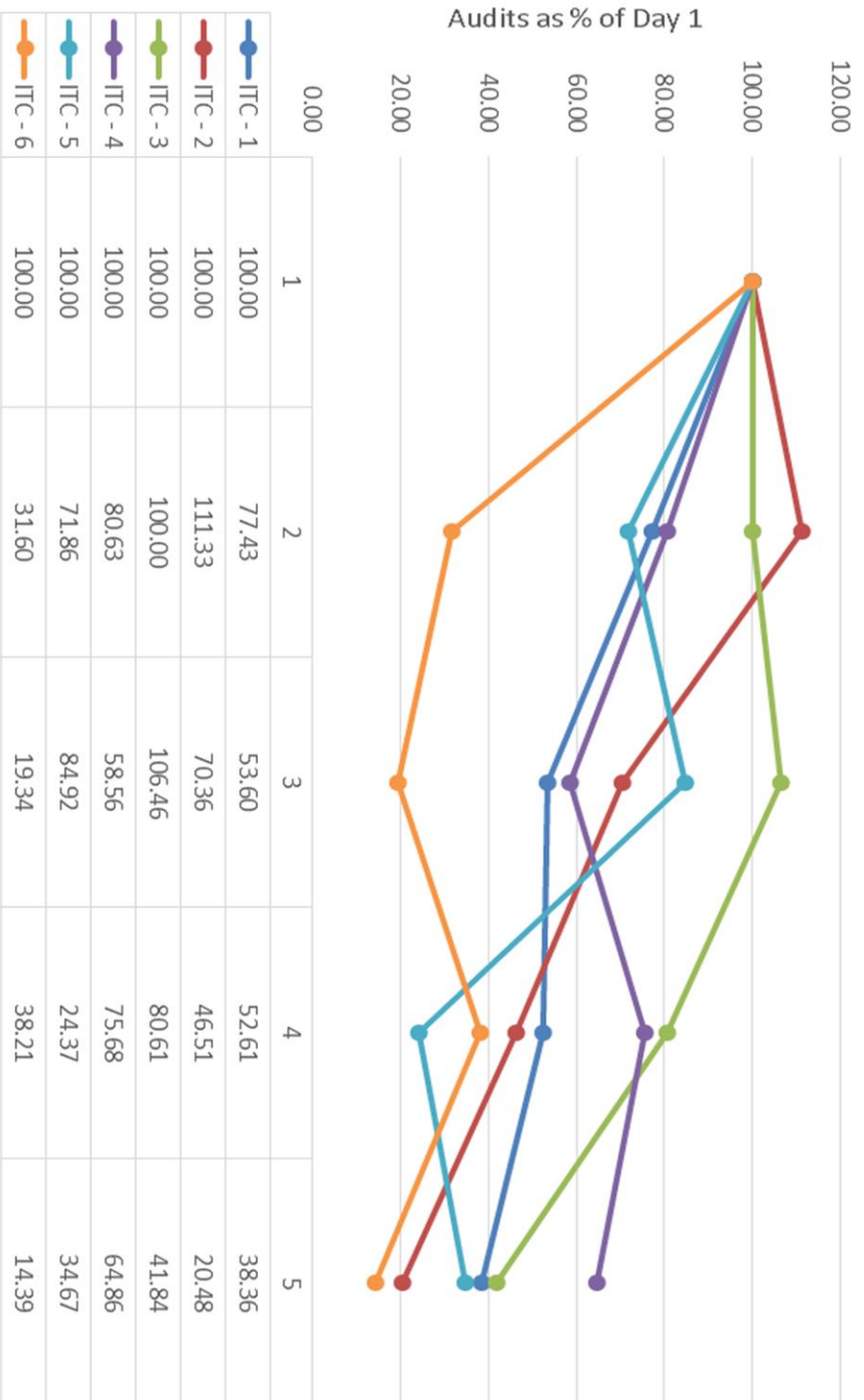


Figure 9: Total audits recorded per day

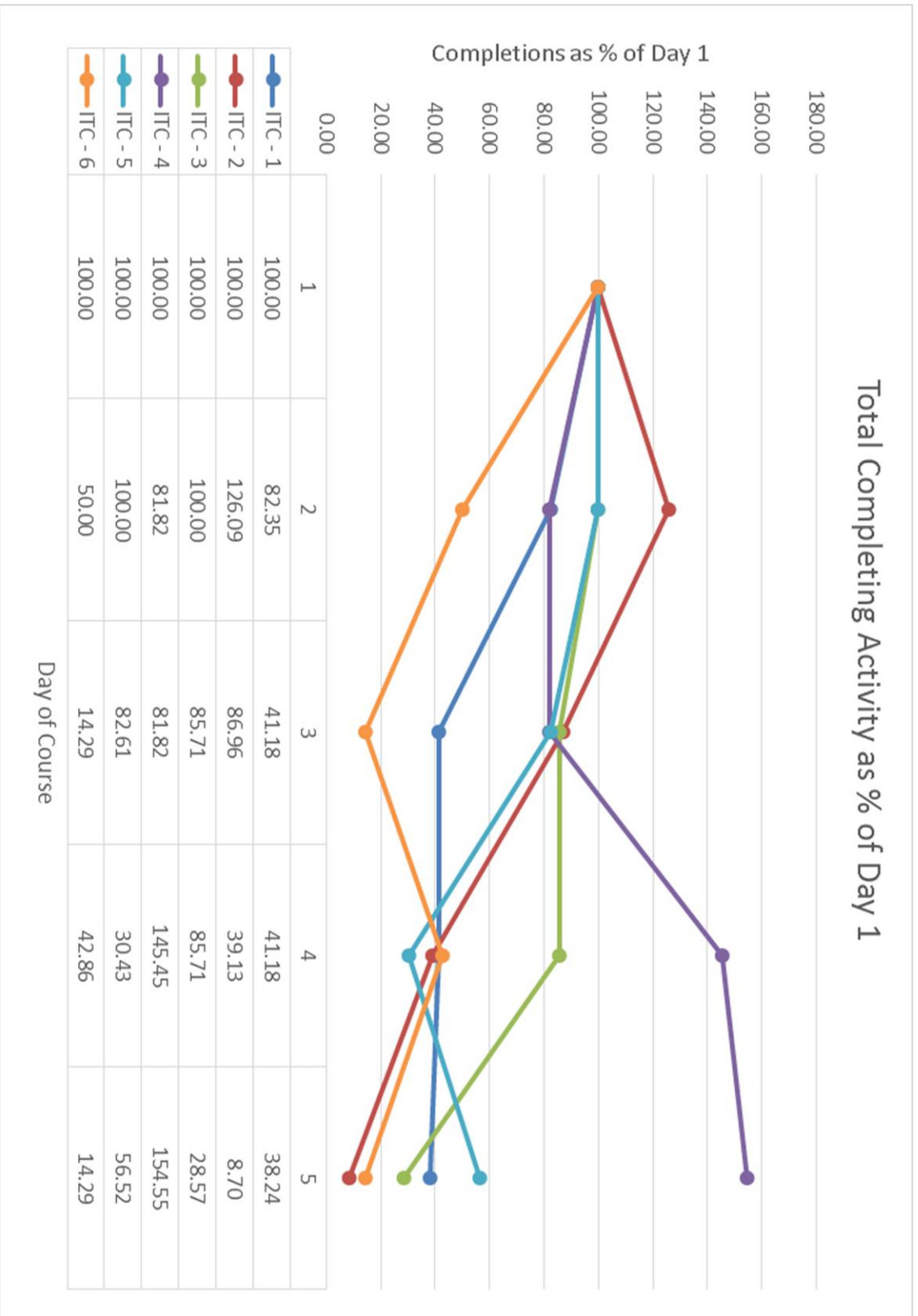


Figure 10: Total completions recorded per day

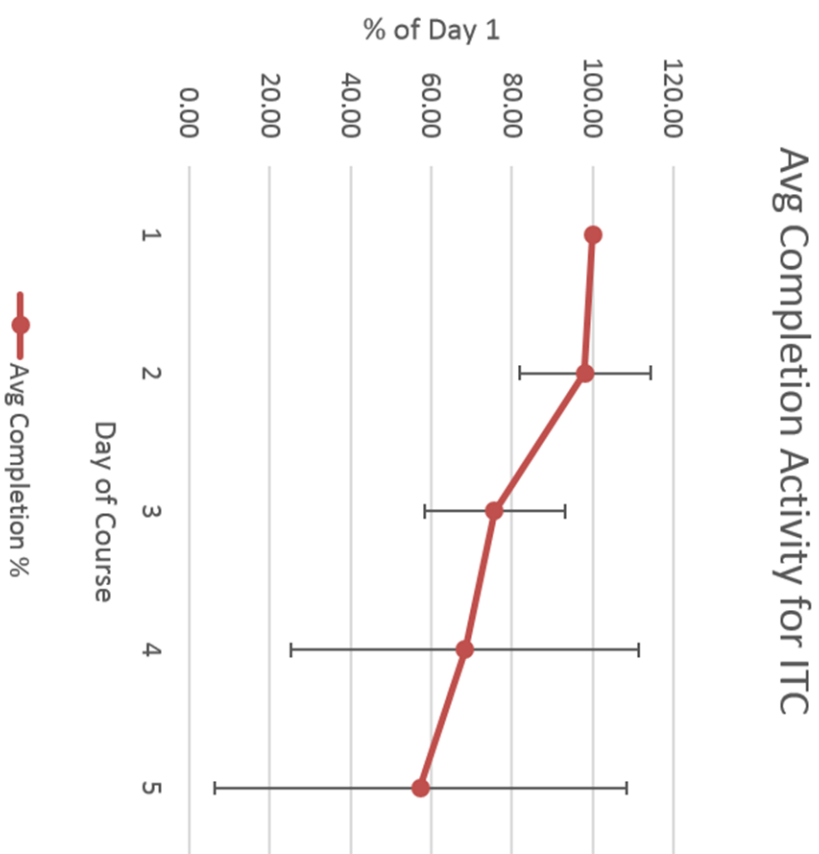
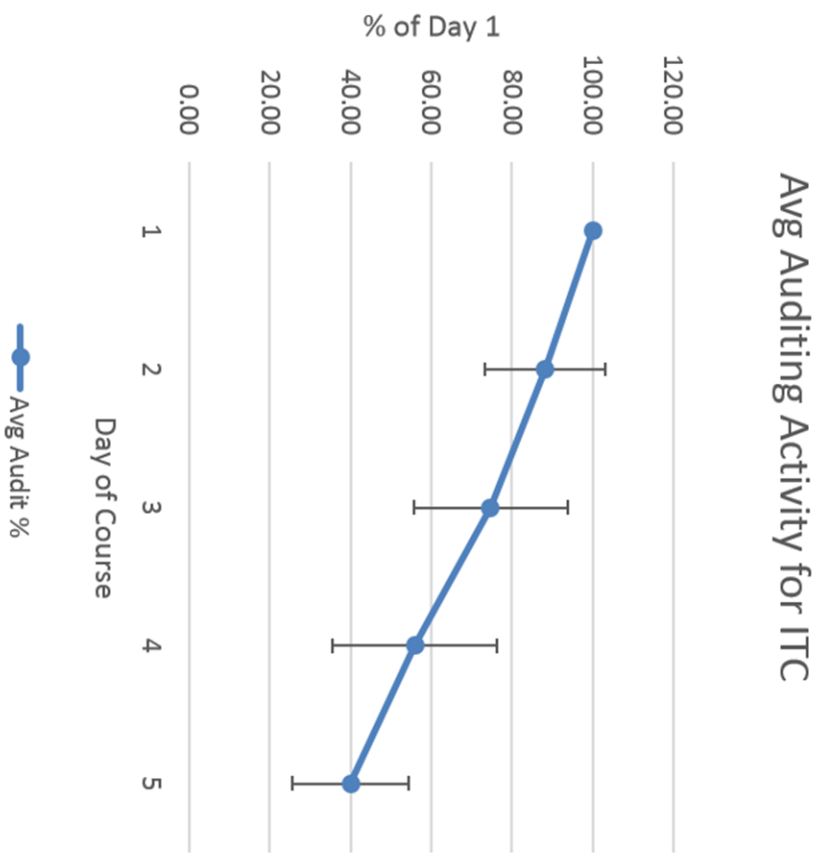


Figure 11: The average auditing and completing activity measured across 6 instances of ITC.

Figure 7 and Figure 8 show auditing and completing activity respectively, individually per participant, for one instance of the course. This data was sourced for each of the six instances of ITC, and was used to produce a measure of how many participants audited and completed on each day of each course instance. The graphs of auditing and completing activity are shown in Figure 9 and Figure 10.

Next, the average auditing and completing values were calculated for each day, which produced a baseline trend graph based on the average from all six instances. This graph is shown in Figure 11 with bars to indicate the standard deviation for each measure.

As can be seen in Figure 11, the overall trend is a drop in Auditing and Completion through the course. However, the error bars for Completion are large enough to confuse matters, being greater than the drop itself and so cast doubt on the significance of this result.

4.4.2 Method 2: Daily Participants

The next measure of engagement tested was that of daily participants. The belief behind this measure is:

If a participant interacts with the course on any given day, then that is counted as successful engagement regardless of volume.

This measure of engagement counts how many participants audited an activity on a given day, and how many participants completed the course on a given day.

Similar to the previous measure, individual course data, as shown in Figure 7 and Figure 8, were used to calculate participant numbers per day for each instance. Then an average was taken, again, to produce the following results.

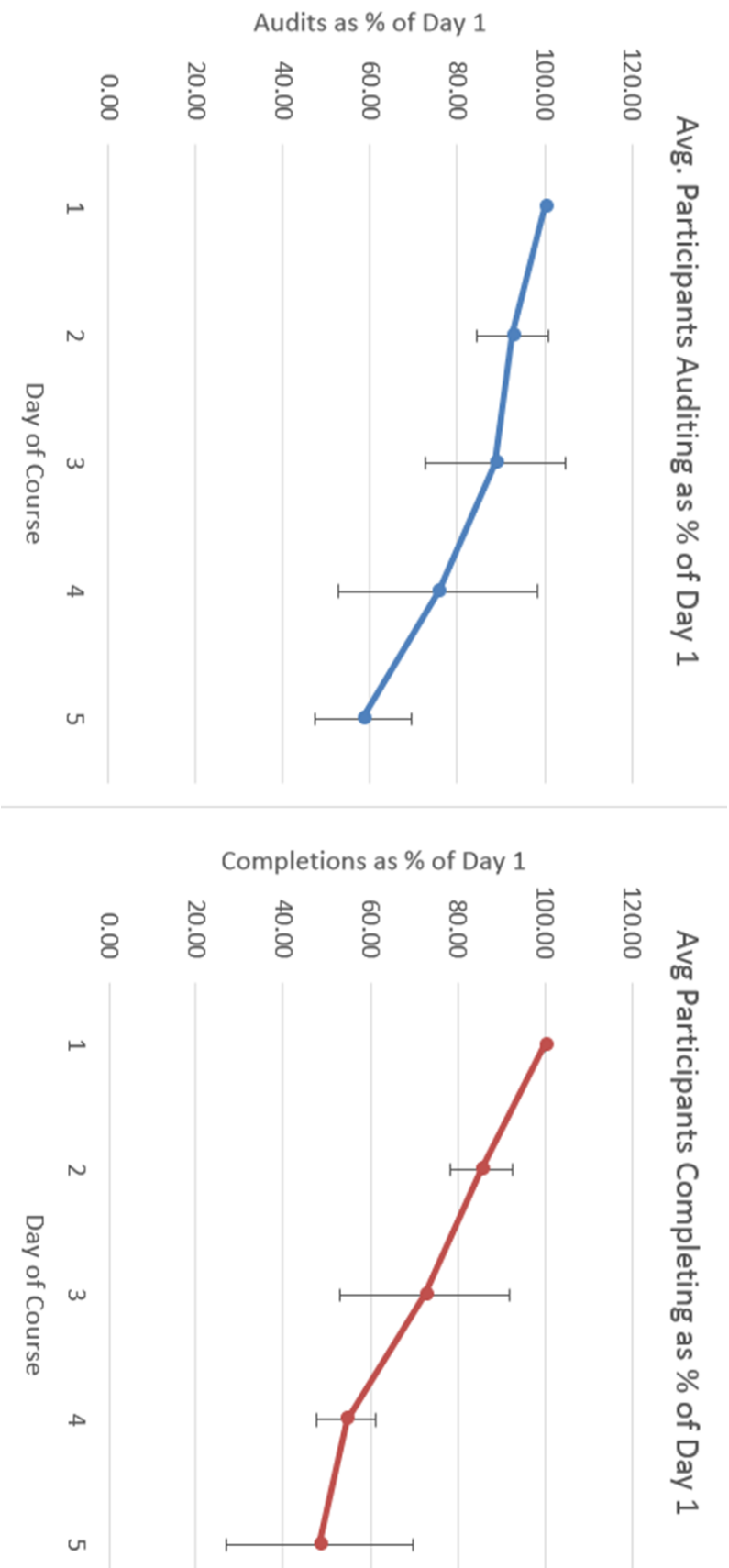


Figure 12: The average number of participants auditing and completing each day of the course.

As can be seen in Figure 12 the downward trend in engagement is still present, similar to that found in volume of activity. The margin for error in auditing activity is similar here to that found in the previous measure. The margin for error in Completions, however, is much smaller, and this graph shows a more statistically significant result than the previous measure.

4.4.3 Method 3: Participant Categories

The third measure of engagement uses a variation of the participant category model proposed by Kizilcec, Piech and Schneider (2013). Categories have been defined in the context of this study as follows:

- Completers - Any participant completing 4 or 5 days of activity.
- Auditors - Any participant who is not a completer, but audits 4 or 5 days of activity.
- Disengager - Any participant who does not meet the above categories.

For the purposes of this study, the Sampler category has been disregarded. It is felt that sampling is less relevant to BSL courses which run over a very short timeframe.

Participants were allocated to the above categories based on an analysis of their behaviour over the week. These results were then collated and an average for each category calculated.

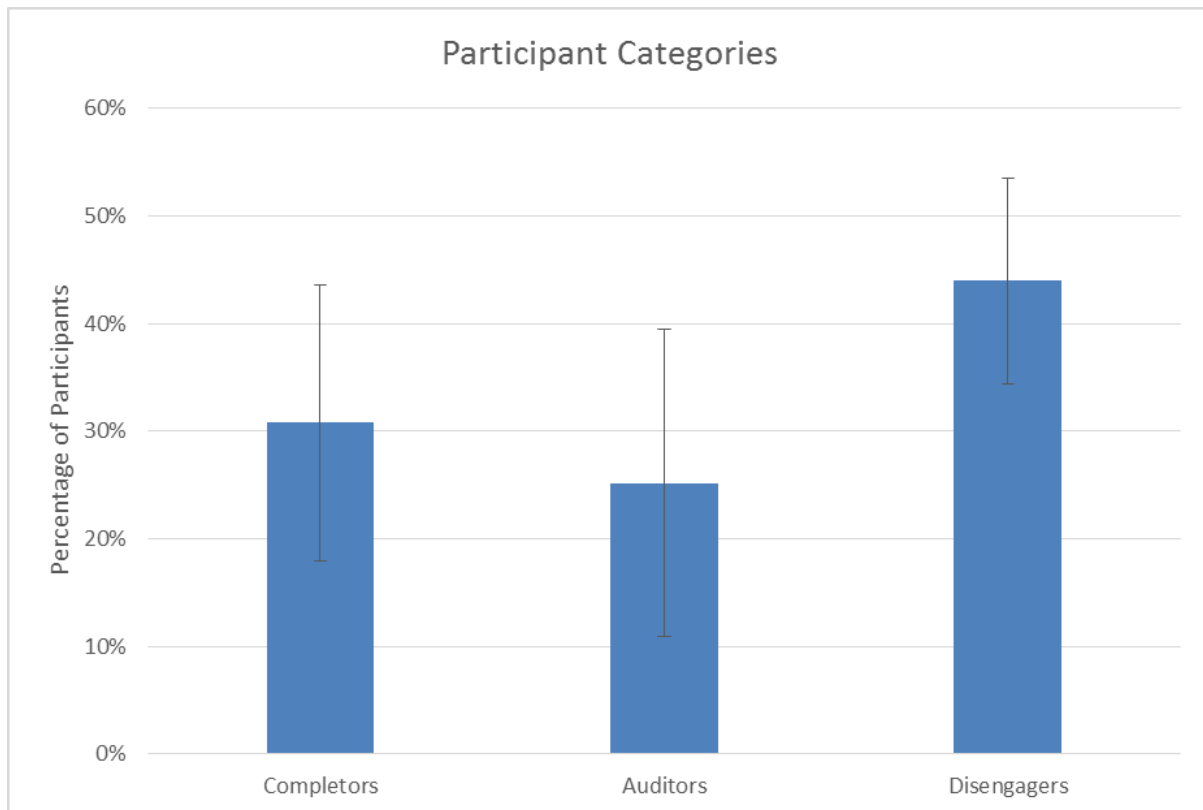


Figure 13: The Average percentage distribution of participants in engagement categories for the ITC course.

As can be seen in Figure 13, the largest category is that of Disengagers. The error bars show, however, that the difference isn't significant, and that, accounting for error, Completers and Auditors are near indistinguishable.

4.5 Discussion

This aim of this study was to investigate effective measures of engagement within an online work based learning context, particularly when employing the bite sized learning method defined in section 1.2. To this end, three methods of measuring engagement have been tested and the results shown.

Method 1 was a measurement of activity volume. This was initially thought to be a good measure of engagement, but as the results were analysed it became clear that

a flaw was present when used in the BSL context. This flaw arose when a small number of individuals participated in a high level of auditing or completing activity. In large courses, such as MOOCs, an individual user doesn't have the power to bias results in this way. The average number of ITC participants was 14, however, and a 4 or 5 message conversation between two participants had the power to skew results quite dramatically. This effect was discovered following an investigation of the high level of error seen in Figure 11. In searching for a reason for this level of error, the author noted that some instances of ITC had particularly large completion numbers on days 4 and 5 (as seen in Figure 10). When looking at individual data, these numbers were due to conversations between participants and the facilitator where 1 or 2 users 'completed' numerous times.

Method 2 was devised as a means to mitigate the problems discovered in method 1. It was felt that completions and daily activity were a good measure of engagement, but volume itself was flawed in a small class sample. Therefore, daily participation was seen as an alternative that gave every participant equal weight. It can be seen in Figure 12, when examining completions, that the margin for error in this measure is significantly lower than in method 1, particularly on days 4 and 5. The margin for error in auditing is similar to that seen in method 1.

Method 3 was tested to assess the measure proposed by Kizilcec, Piech and Schneider (2013). While the time-scale of the MOOC in question is much greater than that used by ITC, the categories map quite naturally, substituting weeks for days, and assessments for discussion tasks. The results of this classification show that disengagers are in the majority, if not significantly. This aligns with Methods 1 and 2 where a drop-off in activity through the week is clear. This is a useful method

for assessing the success of the course for individual students, and may prove a significant measure when comparing variations of courses within later experiments. The individual student view is something that is not accounted for within Methods 1 and 2, which look solely at whole group patterns. The margin for error in this method is high, however, and so it should be used carefully. It also seems to dispense with some of the detail provided by other methods, such as a measure of daily decline, and so, if used, it could be allied with method 1 or 2.

4.6 Conclusion

Overall, it is felt that the most accurate results were produced by method 2, the measure of daily participants. This method showed the lowest margin for error of the three, and retained a great deal of detail in the level of engagement throughout the week. This detail is felt to be very important when assessing the success of course interventions and teaching methods, especially if varied approaches were to be tested throughout the lifetime of a course.

While method 2 seemed to be the most accurate, method 3, Learner Categories, may prove useful in an experimental context when comparing two variations of a course. The view of individual student success or failure may provide useful insight when used alongside overall engagement patterns, giving both the macro and the micro view. As stated in the previous section, the errors in this method have been found to be high within the BSL context, so conclusions may not be reliable when drawn from this alone, but allied with method 2, and the qualitative data, it may provide further detail and triangulation. Therefore, method 3 will be used alongside method 2 in some elements of this project.

It is felt that the results outlined in this section could contribute to the reliability of research around engagement measures in both BSL and the wider world of online learning and MOOC experimentation. The research provides a specific approach for the measurement of engagement within the Moodle platform, and will allow teachers and learning developers to test the success of their approaches in that context. It also provides a model for evaluation in other contexts where similar analytics can be sourced.

This chapter has outlined the method which will be employed to measure involvement within BSL courses. In the next chapter, the first stage of research, the Teaching Format Snapshot, will be carried out. This segment of the thesis will draw a picture of the current state of BSL, implementing the measures outlined in this chapter, and combining them with a qualitative analysis. This combination, which represents Stage 1 and the first mixed methods element of the methodology stack outlined in Chapter 3, will move towards a theory of BSL which can then be used for further experimentation and development.

5. Teaching Format Snapshot

5.1 Introduction

In Chapter 3 the methodological approach of this research was explained, including the three stage process which structures the work. The stages are labelled Teaching Format Snapshot, Teaching Format Experiment and Teaching Format Theory. In Chapter 4 the basis for measuring involvement and engagement was explored, something which underpins the quantitative data within all three stages.

This chapter will now outline the research carried out in stage 1 of this research: the *Teaching Format Snapshot*. The outcome of this chapter will be an impression of the baseline patterns of involvement and engagement within one example of Bite Sized Learning (BSL) and a theory around why that pattern emerged. This baseline pattern and theory will form the foundation for future research into BSL, allowing experiments to be conducted in stage 2: the Teaching Format Experiment. The aim, at that point, will be improving on that pattern and developing the theory of BSL.

This chapter will begin with an outline of the courses run within the Teaching Format Snapshot and will proceed to report on the data gathered and the results found. The baseline engagement patterns that this chapter aims to uncover will be sourced by analysing one particular course, "In the Cloud", and investigating six instances of that course in depth. This course and its context were outlined, in detail, within Section 4.2.

Learning analytics and qualitative data will be gathered from each instance of this course to produce a mixed methods analysis of engagement within the BSL model, as outlined in Chapter 3.

5.2 Learning Analytics Analysis

In Chapter 4, work was carried out to determine the most effective method of measuring engagement within BSL, and a measure that is relevant to the wider area of online learning.

In this section, an analysis of those engagement patterns will be related within the context of the ITC course described in Section 4.2. While the main purpose of the analytics data is to provide a quantitative measure of involvement, and thus engagement as shown in Section 2.7, these patterns also contribute to the overall mixed methods analysis of BSL. The data helps to provide insight into how students interact with the learning method which is then expanded upon by the qualitative data to follow. The combination enables conclusions to be drawn around the effectiveness of the method and ways in which it can be improved in Stage 2 of this project: the Teaching Format Experiment.

This section will primarily draw conclusions from the Method 2 measurements outlined in Section 4.4.2 for the reasons outlined within that chapter. Details will be drawn from other methods, as needed, when they may add insight.

5.2.1 Decrease in Engagement Within ITC

The quantitative analysis of the ITC course highlights the core problem present within online learning, as discussed in Section 2.3.5: overall participation drops dramatically between the beginning and the end of an online course. Therefore, retention and falling engagement are confirmed as issues within online learning, and within BSL as a sub-set of that.

The statistics for ITC demonstrate this trend. As shown in Figure 12, on average, the number of participants consuming materials is significantly less on the final day than on the first day (58.4% of the 1st day total, $s=10.1$).

Similarly, the number of participants contributing material is significantly lower on the final day than the first day (48.3% of the 1st day total, $s=21.44$).

5.2.2 The decrease in the average number of students

One notable trend which was discovered when comparing Method 1 and Method 2 results is that the decrease in the average number of students who access the course per day is less significant than the decrease in overall consumption. This suggests two possibilities:

- Most students stay reasonably engaged, but all interact with less content as time goes on.
- Most students become disengaged, interacting with very little of the course, while a small core of students retain their engagement level from day 1.

Further investigation of the stats from individual courses shows that the former seems to be prevalent.

P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17
5	47	41	9	35	42	3	27	0	2	34	25	0	0	16	0	8
0	30	23	0	32	27	24	22	2	6	14	24	0	0	54	32	4
41	30	0	75	0	13	14	19	62	0	13	0	28	18	0	0	0
36	53	0	34	51	7	3	41	2	1	1	8	0	0	0	0	0
0	25	0	61	7	26	0	4	0	0	0	0	0	0	0	0	0

Table 3: Consumption data from one instance of the ITC course for 17 participants. Rows represent days, and columns represent participants. The data represents volume of auditing activity that day.

Table 3 shows the consumption data for 17 participants (P1 to P17) over 5 days of the ITC course. Each row represents a day, from Monday to Friday. It can be seen

that participants 9 to 17 participate less towards the end of the course than at the start, and P13 to P17 disengage in the first half of the course. P1 to P12, except for P3, all participate to a good extent, but less as the course goes on, with some individual exceptions.

These results suggest that participants want to attend the course each day, but that time spent on the course is more limited towards the end of the week. This would cause a lower drop in participants than consumption. Another possible explanation is that participants find less value in the material as the week progresses and so interact with it and the discussion tasks less. This is where mixed methods are valuable; the thematic analysis process will provide insight into which conclusion is more likely.

5.2.3 Category Insights

Method 3 produced data on the categories into which participants fall. This suggests that, on average, the majority of students Disengage, but the margin for error showed that this was not significant. When looking at individual course data, as displayed in Figure 14, it can be seen that course instances seem to fall into two main groups, with one outlier.

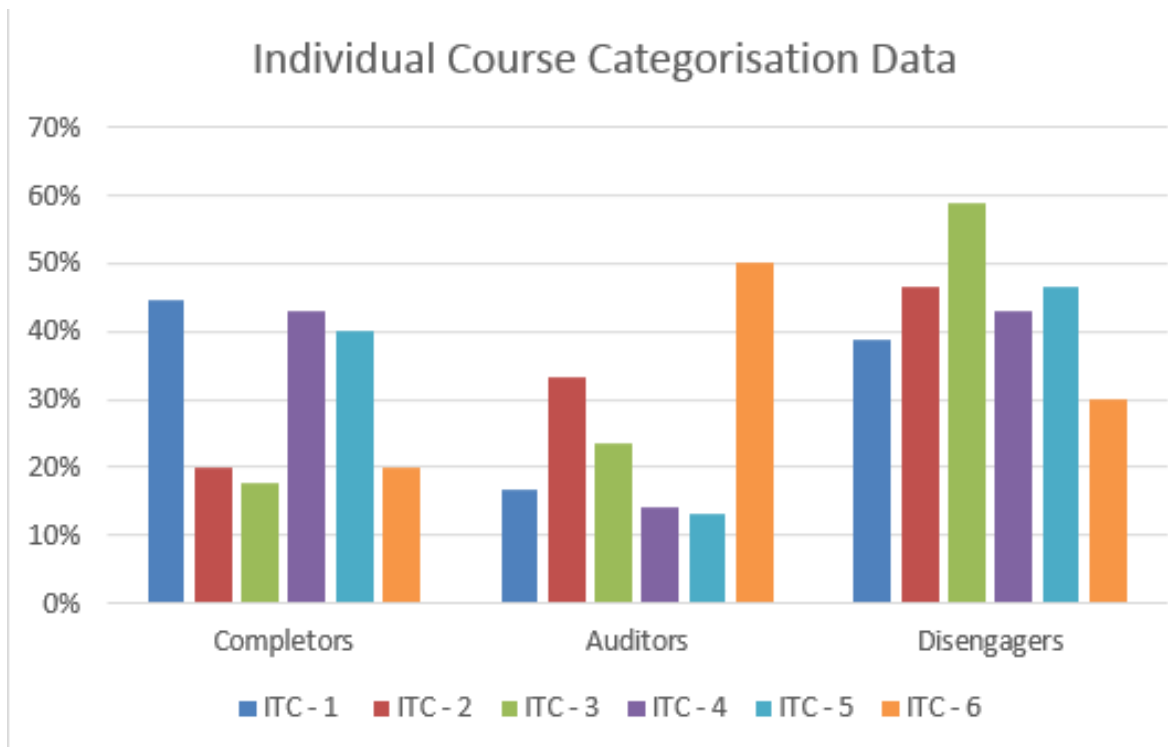


Figure 14: Individual Course Categorisation Data - each instance is represented in the legend by a different colour.

Instances 1, 4 and 5 have very similar stats across the board. Instances 2 and 3 are very similar in terms of completions, and relatively similar in the auditor and disengager categories. Instance 6 is an outlier, being dramatically different from any other instance in both auditing and disengaging activity.

If taking the two main groups into account, course instances seem to fall into two patterns:

- The majority of students split between completers and disengagers, while some fall into the auditing category (ITC 1, 4 & 5)
- A minority of completers, a majority of disengagers, and middling number of auditors (ITC 2 & 3)

These two patterns suggest that there is a thin line between completion and auditing. The number of disengagers is consistently high, close to 40% or more, but the number of completions and audits are split. So, something in each instance may tip a significant proportion of participants from auditing to completing. In looking at the data, course size does not seem to be a factor, as 1, 4 and 5 include a range of participant numbers. Course materials were unchanging between courses instances, therefore the only changing factors were discussion participation and facilitator support. As a consequence, perhaps increased social participation on the part of some students is something that can move more students to completing behaviour, and therefore more engagement on the part of the course. This suggests that some participants lead by example. Once a number of students 'complete' a task by posting their thoughts on the discussion, a snowball effect ensues and encourages others.

These conclusions will be given further insight when combined with qualitative data in the full mixed methods analysis found in Section 5.5.

5.3 Thematic Analysis Approach

5.3.1 Introduction

As explained in Chapter 3, a mixed methods analysis was utilised in this stage of the project in order to explore AND explain the learner trends discovered within the course instances.

In this section the thematic analysis approach will be described. In the following section, 5.4, the qualitative data garnered from "In the Cloud" participants will be explored and analysed, and concepts that emerge from this analysis will be discussed. The aim of this process is to uncover the following:

- The strengths and weaknesses of the BSL format, according to this group of learners.
- Underlying themes on how this group of work based learners WANT to learn.
- Underlying themes on how this group of work based learners ACTUALLY learn.
- Barriers present within this group of work based learners which prevent optimal learning.

In Section 5.5 to follow, these qualitative findings will be combined with the quantitative data previously explored and a full mixed methods analysis will be presented. This analysis will provide a deep understanding of the trends that emerged from learner interactions with the "In the Cloud" course. That, in turn, will provide insights into methods for fostering learning engagement in this context, and provide a basis for an experiment in Stage 2 to improve the Bite Sized Learning approach.

5.3.2 Data Collection

As part of standard evaluation and course development practice, surveys were run following any instance of "In the Cloud," wherever possible. These surveys contained a collection of questions around the effectiveness of the course, the teaching method, and a request for improvement suggestions. The survey form is shown in Appendix A. The key aim was to explore students' feelings on the learning experience, and to explain the trends discovered by the quantitative analysis. This represents the explanatory Stage of the project's sequential explanatory strategy. The survey questions are included in Appendix A.

Four surveys were run from the six possible instances of the course. Details of the survey responses are shown in Table 4.

Date	Survey Sent?	Participants	Survey Responses	Code
October 2012	No	18		ITC-1
February 2013	Yes	15	9	ITC-2
September 2013	Yes	17	4	ITC-3
November 2013	Yes	7	7	ITC-4
January 2014	Yes	15	12	ITC-5
March 2014	No	9		ITC-6

Table 4: Details of the surveys administered to the series of six ITC instances.

The survey was sent to 54 learners in total. 32 people responded, giving a total response rate of 59%.

5.3.3 Analysis Methodology

When coding the survey responses, the thematic analysis method defined by Braun and Clarke (2006) was followed, as defined in Section 3.7.

It has been proposed that the details of Thematic Analysis, and coding in general, are often glossed over in the literature (Tuckett, 2005). Studies will state that a particular method has been followed, but fail to cover details on how the analysis was carried out. For the purposes of transparency, and to help develop a more

detailed picture of this type of analysis within the field, the methods used within this project will be covered within this section.

Tools

In all forms of research, this author prefers to work digitally as much as possible. Field notes and logbooks, for example, are kept exclusively in Evernote. Evernote is a cloud based tool which works with desktop and mobile apps to allow note taking in many forms, including text, photo and audio (Evernote Corporation, 2015). It incorporates powerful organisation and tagging functions which allow for precise filing of research and other work information.

The one exception to digital logging is within face to face meetings where handwritten notes are taken. These are then transcribed into Evernote and filed appropriately at the earliest opportunity.

Evernote was also used within this coding process to keep research memos, and to log the process as it continued. This allowed for themes to emerge gradually, and for streams of thought to be recorded as codes were generated and refined.

The main process of coding was carried out in NVivo. NVivo is a dedicated qualitative analysis package, designed to facilitate coding (QSR International, 2015). Survey data was imported to NVivo, along with other artefacts, such as discussion postings and emails. From there, coding could be carried out.

Process

First, the 4 survey datasets were exported from Google Docs and Ultimate Survey, and transferred to Excel for standardisation (e.g. adding participant numbers and

column headers). Next, the data was imported to NVivo, each survey dataset forming one source within the package.

Phase 1 of Braun and Clarke's process was followed by reviewing the survey questions, and then skimming the answers of the first survey to become familiar with the data. This survey was then analysed, in detail, in phase 2 and a set of initial codes were generated based on phrases and concepts that appeared to be related to the research questions. By the end of phase 2 a set of initial codes had been uncovered, and they were present in a non-hierarchical form within NVivo. Phase 3 involves searching for themes, and this is where codes were grouped together to form those major and sub-themes. Phase 4 then involved a process of reviewing those themes, and in the first round this led to further reorganising. Phase 5, finally, involved creating definitions for the resulting themes which would better inform future rounds of this process.

The next stage was to move on and repeat Phase 2 and 3 for the next survey. In Phase 2 codes were generated based on relevant concepts which appeared in the survey data. When these codes fit existing themes, they were integrated, and when they didn't they were placed on the top level of the coding tree. Then, in phase 3, the themes were examined again, modifying them based on the new codes. This often involved reorganising and refining themes as new concepts were integrated, or entirely new themes were created to accommodate codes if necessary.

This author found that it was worthwhile repeating Phases 2 to 5 for each survey. Phases 2 to 4 form the main work in generating and refining data, while Phase 5 provided reflection on the work done so far, and forced critical thinking in the

generation of a definition. This repeating cycle formed the iterative process that is often described within grounded theory development and action research in general.

Each new set of survey answers would generate a number of new codes, which would then have to be fit into the existing themes (categories). This would prompt a further review of the existing themes, and lead to various stages of review.

In the case of this project, this work resulted in 4 iterations of the Phase 2 to 5 cycle, characterised by the coding of anything between 4 and 12 individual survey responses. In other projects this could be replicated by splitting research artefacts (1 full participant survey submission in this case) into groups of around 10, and repeating the cycle for each 10 surveys. This author feels that, using this procedure, later cycles may be carried out with larger groups of artefacts as the codes and themes become more refined.

5.4 Thematic Analysis Results

5.4.1 The Course Format

The Course Format MEANS the effect that the structure and delivery method of the course had on learning effectiveness for the students.

Course format is the largest theme to emerge within this project, gathering 80 references in total. This is to be expected given that the survey which was administered to participants following each course contains questions which specifically refer to the course format. In addition, this investigation is primarily interested in the effect of the course format on learning and so these references were more obvious during coding.

The course format theme contains a number of sub-themes, each of which will be discussed here.

5.4.1.1 Task Length

The *Task Length* sub-theme contains any reference to the length of each individual daily task within a BSL course. This sub-theme contained one of the largest groups of references of any at 23 references.

As an initial validation of the BSL hypothesis, participants commented on the fact that the short 30 minute tasks was a desirable element of the course: "the 30m a day advert for course was attractive." This shows that one of the key ideas behind BSL - bite sized tasks - is something that attracts WBLs to learn.

Some comments also demonstrated the factors that were attractive to learners:

"short daily tasks over a week or so definitely motivate me to plug away at it and not have a big mental barrier about participating." This suggests that BSL may get over some of the inertia in taking part in learning, allowing short, easy, barrier free chunks of learning to take place. These barriers are obviously clear to some learners, as demonstrated here: "Short dailiy[sic] activities ought to be feasible." The consideration of what would be "feasible" in the participant's working life is telling of the time-based barriers present.

The fact that short tasks were particularly attractive to learners is backed up by the number of comments referring to the contrary: that the tasks ended up taking longer than the 30 minutes promised. It was this concept that drew the most extensive responses, including:

- "maybe i am slow...but it took me almost 1.5h today to do all of excercise[sic]."

- "I found the tasks took longer than an hour a day."

It is obvious from this feedback that the time estimation when creating the learning material was, in many cases, too low. The number of responses concerning this highlights the fact that this *30 minute task* promise was a major draw to the course, and therefore worth pursuing and investigating further.

As an added insight related to this, a number of comments referred to negative feelings when tasks seemed to take longer than the time allocated: "once it took longer than 30m I was discouraged." This highlights the fact that time allocations must be generous in a BSL course. If users go over the allotted time then they start to dis-engage from the course due to negative feelings on their own performance. This happens even though this is the fault of the instructor in underestimating the time required.

5.4.1.2 Duration of Learning

The next sub-theme is *Duration of Learning*. This refers to the duration of the course as a whole and contains any reference to the length of the course, or how often tasks occur; something which directly affects the length of a course. In the case of ITC, the duration was 1 week, with tasks being delivered on a daily basis.

Within this theme, there was one positive comment on the course length itself: "Covering the content over a week gives you the time to digest what you have learned from one day to another." This individual considered one week a good time over which to cover the material. Almost every comment otherwise, however, suggested that the time period was too short.

One participant stated that the course was, "maybe a bit fast and furious," suggesting that a task every day proved too much to keep up with, even when the task is bite-sized. Five of the ten references in this node suggested "2 weeks" as a specific time period, and some comments clarified this by stating that a task every 2nd day may be a more sustainable pace.

On the daily tasks themselves, there were a large number of positive comments relating to the daily delivery concept, including: "Keep on with the short daily tasks," and, "The daily tasks that built on what was done the day before also made it easier to manage," and, "Introduction to a new topic each day worked well." This suggests that daily delivery is desirable, and in fact may offer advantages, such as building on concepts at a regular pace. This may be backed up by the reference within the Task Length section, stating that the short tasks, "definitely motivate me to plug away at it." This concept of *plugging away* demonstrates one of the advantages of daily tasks - the rhythm and habit that is achieved when something short occurs every day. But, the course length comments, requesting a two-week duration, may contradict this.

One possible factor in this contradiction is the inclusion of a social aspect to each activity. Every day users were asked to post their experiences and opinions on the learning materials and tasks. Two people specifically stated that they'd prefer, "more time to get our heads around it," before posting in public.

In the context of ITC, it's clear that people struggled to keep up with the material, even though they see the daily delivery method as advantageous. There are two possibilities: 1. even with very short tasks and the advantages this brings, learners will struggle to take part every single day. 2. the amount of activity required in each ITC task in particular was too great, and should be pared down, or allocated to 2 day

blocks. The former is confirmed in part by statements relating to missed days and catching up, e.g.: "It seemed like most people, me included had at least one day in which they couldn't complete the activity." As shown within the *Task Length* section previously, however, it is likely that difficulties were mainly attributable to over-long task lengths, and so positive comments towards the daily delivery method may be taken as validation of the format's effectiveness.

5.4.1.3 Lack of Face to Face

In terms of disadvantages ascribed to the course format, a *Lack of Face to Face* contact time was the most prevalent (9 references). This is strongly related to the flexibility theme in Section 5.4.2 in that increasing flexibility tends to decrease the possibility of instant support. Instant, face to face support requires a classroom setting, for example, which almost completely removes flexibility.

As a balance, one minor theme that emerged which is somewhat related was *Student Support* and this encompassed any comments on the tutor support that was offered. There were four references stating that "the facilitation is really supportive" or a similar sentiment, so the asynchronous support was effective to an extent.

When looking in detail at the comments it transpires that the underlying theme is related more to a lack of instantaneous help than actual in-person support: "...getting stuck and not having immediate feedback from tutor." This theme is present in most of the comments within *Lack of Face to Face*; the time delay in receiving support is the big issue, rather than physical presence. The comments often referred to face to face support as a solution, simply because that is the participant's experience of standard tutor involvement. This means that having a synchronous method of online support may be a way to solve this problem.

This possibility is supported by the following comment: "plus tutor "live" feedback immediately, or at least an hour set aside where tutor would feedback 'live'." In order to support all students and their flexible working times, immediate feedback in this context would be impossible without 24 hour staffing. Therefore the latter suggestion, of a scheduled live support session, may be a way to partially overcome the concerns and barriers that arise with asynchronous support.

Another possibility, related to the previous sub-theme, is that running the tasks over two days rather than one would allow more time for asynchronous support, so this could be a tactic worth experimenting with in future within the BSL format.

One participant saw a possible benefit in the lower level of support available, however: "Sometimes I fiddle about a bit on the wrong track....and no instant answers. But a bit of practice overcomes this and it does force you to investigate more yourself rather than passively in a class setting.....which embeds learning more I think." This learner acknowledges the self-sufficiency which is built by a lower level of support, and the problem solving skills that it develops.

5.4.1.4 General Course Format

This sub-theme, *General Course Format*, recorded general references to the course format. Three comments were recorded in total, two of which stated that "I like the course format", and the third liked "the way the course was structured."

Because of the unique nature of the BSL format, this is a useful validation. Despite the unexpected method of delivery, and a number of issues as recorded within the themes throughout this section, there were participants with unequivocally positive feelings towards it. The more validation of this sort that can be sourced, the more worthwhile it makes future development of the method.

5.4.1.5 Buffet Model

This sub-theme, *Buffet Model*, contains any reference to delivery of all course materials at the beginning of the course period. This is opposed to drip feeding material in the daily delivery format favoured by BSL. The name refers to the Buffet Model of course delivery which is discussed in Section 2.3.8 and offers every element of a course up-front, allowing the learner to draw from the buffet of learning as they choose.

Three separate references suggested releasing all learning materials at the beginning of the course period, with the justification that it would add flexibility. This relates closely to the Flexible Order of Consumption theme in the following section, and so will be discussed in more detail there.

5.4.2 Flexibility

Flexibility MEANS offering options to the learner in HOW they learn.

Flexibility was the second most common theme found within this coding process (46 references), confirming that it is a key concept within this research, as suggested within Section 2.4.

Flexibility is closely related to the *Course Format* theme as flexibility is built into the BSL course format itself, and is one of the prime considerations of the design. Therefore, some elements of the course format theme parallel or overlap with the theme of flexibility.

In terms of recognising *Flexibility* as a key theme, numerical frequency is not, in itself, an indication of importance, but the prevalence of references is backed up by the appearance of flexibility as a theme in the grounding literature.

As discussed in Section 2.4, work based learners value flexibility above almost anything else (Brennan, 2005). For this reason, when the bite sized learning format was defined, flexibility of learning was a core consideration. Therefore it would be expected that this theme would arise when discussing learning with a group of work based learners in a BSL context.

One question within the survey asked the respondent what they felt the advantages of this type of course were. Flexibility in general was mentioned more often than any other concept (14 references), often as a simple one word answer, "flexibility", or as a more detailed phrase, "Delivering the course in this flexible manner." These mentions of flexibility in general are useful as a measure of positive reaction towards the course format, and the frequency of the concept's appearance can be seen to validate the choice to prioritise flexibility in the design of the BSL format.

Within the *Flexibility* theme, it was possible to determine the component elements of flexibility in the BSL context. Examples of this include time flexibility, location flexibility and flexible consumption order. Each of the elements will now be explored.

5.4.2.1 Time Flexibility

Time flexibility was the most numerous of the flexibility sub-themes (22 references). These comments centred on the ability to take part in a course "at a time that suits me". The constant appearance of the word "time" demonstrates how this is a constant barrier or concern to work based learners.

Respondents mentioned *work* and *schedule* often, and the main advantage they found in bite sized learning is that it can "fit around my work tasks". The barrier present here is well demonstrated by the following quote: "I constantly miss Staff Develop[sic] things which are on when I teach."

A related element of time flexibility is that of length and frequency. This quote demonstrates the concept: "It meant I could...fit it in to a stray ten minutes here of there. I like to do a bit of work then reflect on it later so it suited me well."

As in many areas within this study, both of these concepts are a comparison to larger blocks of learning; the traditional method for work based learning, where a learner will be occupied in one block of learning for an hour, a half day or even a full day.

The latter quote above reflected the desire to learn in very short *bite sized* chunks of learning, and appreciated the ability to take time to reflect, before moving on to the next day's concept. This reflection time, in particular, is much harder to achieve in traditional workshops or seminars where each student may need more or less time to do so. Furthermore, the previous quote stated that a participant will often be entirely unable to attend this type of learning intervention, simply because it will not fit within their schedule. In the latter case BSL allows the learner to participate, when otherwise they would not, and the former demonstrates where BSL has an advantage over these traditional methods when it comes to WBL.

The remaining sub themes were referenced a great deal fewer times than *General Flexibility* or *Time Flexibility*. They are worth some coverage, however, as they uncover some interesting considerations.

5.4.2.2 Location Flexibility

This theme, *Location Flexibility*, highlighted the advantages to work based learners of being able to access their learning from any location. Leading on from the *Time Flexibility* theme, it seems some learners take part in learning outside of working hours. This may be due to time restrictions, and flexibility in location is as important

as time in working around this: "being able to do it in work or at home." Furthermore, WBLs often have flexible working arrangements, working in various tasks or roles which may take them to different locations: "I liked being able to do it from where ever I was (as a part-time member of staff)"

Location flexibility is mentioned in the literature Nie et al. (2011), and so is not unexpected, but the *part-time staff* aspect, mentioned above, is a new insight. More and more WBLs, in employment or self-employment, work part time in more than one role. This increases the chance that their place of work will change day to day, and further increases the requirement for location flexibility beyond a simple work and home situation.

5.4.2.3 Flexible Order of Consumption

This sub-theme contains any reference to delivery of all course materials at the beginning of the course period. This is opposed to drip feeding material in the daily delivery format favoured by BSL. This is similar to the buffet model of course delivery (Twigg, 2003) which allows full choice to the learner in when and how they interact with material, thus allowing the learner to draw from the buffet of learning as they choose. It differs, however, in that it can still refer to daily delivery, but with the option to go back and revisit previous day's materials.

Participants enjoyed the fact that they could go back and consume material in a different order, or catch up if required: "I was able to go back to the bits I missed." This suggests that bite sized chunks lend themselves well to a more flexible or adaptable learning sequence.

On the other hand, the following comment suggests that the learner would prefer a full choice of materials at the beginning: "...my strategy was to pick and choose what

information I found useful and leave anything that I didn't think would be useful for me."

This sentiment was reflected in one other reference directly, and others indirectly. When aiming for maximum flexibility, as the work based learning literature would suggest (Brennan, 2005), the daily delivery model is at least partly in conflict with that aim. Within this format, it is expected that learners will participate every day, although they have a choice in when and where. This raises the question over whether all materials should be delivered at the start of the course to offer further flexibility. Within the themes of Section 5.4.1, the daily delivery format was found to have a range of advantages, however. Additionally, the implementation of the daily delivery method was based on previous research, particularly the work of Salmon (2004) discussed in Section 2.3.5. For these reasons combined, this is one area where further investigation would be particularly valuable to assess the balance between the advantages of the daily delivery and buffet formats.

5.4.3 Social Interactions

Social interactions MEAN the effect learning and interacting with other students has on an individual's learning and their opinions on that process.

It could be argued that, of the previous two themes, *Course Format* was expected to emerge due to the line of questioning. The emergence of *Flexibility* would have been an educated guess, also, given the relationship between *Course Format* and *Flexibility*.

The remaining themes arose organically, however, and of the more organic themes, *Social Interactions* was the most prevalent. This theme counted 32 references in total, spread across a number of sub-themes.

5.4.3.1 Peer to Peer Feedback

The first sub-theme of note is that of *Peer to Peer feedback*. This encompasses any mention of interactions between peers on the course related to the work being done. As has been mentioned, each daily task required a discussion posting from the participant and they were encouraged to feed back on the postings of others.

Learner opinions on the effect of peer to peer feedback were mixed. Firstly, there were a number of positive references to the inclusion of discussion tasks. One participant stated that "getting feedback from others" was a positive aspect of this course type, and another welcomed "The opportunity to interact with other colleagues."

On the other hand, a number of comments referred to the fact that while they found the social interaction valuable and took part as much as possible, "not all of the participants were able to do so as much, which was a bit of a shame." This reflects a common thread which suggests that the social interactions were not numerous enough to reach a critical mass which offers real value. Learning communities thrive on conversation and feedback, as discussed in Section 2.2.2, but references such as, "I think it may have been helpful to have more people doing the course," and, "It is also discouraging when others don't post anything," suggest that participants did not feel that conversation was sustained or extensive enough to provide value. The root of this problem may have been uncovered within the *Course Format* theme, in discussing the time which was estimated for tasks. It was highlighted there that tasks took far longer than anticipated, and so it is understandable that the final step of each task, discussion around the learning undertaken, would be missed.

Conflict: Flexible vs Social

One argument against the inclusion of social interactions within a BSL course is raised by the following reference: "Most days my scheduled time was earlier in the day so I found I was often the first one contributing to the tasks/discussion forums." This highlights a conflict between optimising flexibility, accessible short tasks and promoting community learning. If the onus is on flexibility and accessibility, then the sustained, throughout-the-day interactions required to sustain community may be untenable.

The idea of conversation also conflicts directly with the promise of a short set-time task, e.g. 30 minutes in the case of ITC. This is highlighted by the following reference: "So when I was ready to discuss something everyone had already made the points I would have raised." If someone chooses to participate late in the day, such as this participant, then the discussions have already occurred and ended between participants who take part earlier. It is possible that the negative feelings generated by this *missing out* outweigh the positive benefits of community learning.

This type of community learning may take the learner away from the focused, outcome based learning that is integral to effective adult learning, as discussed in Section 2.2.1. While literature supports the effectiveness of a learning community, in a WBL context, it may be a *nice to have*, rather than a *must have*, as highlighted by this final reference: "Sometimes I have done with work but don't take part in the discussion purely due to time - I think I'll do it later and then don't get there." Social interaction is the first part to be dropped when life is busy. And, as discussed in Section 2.4, the life of a WBL is very likely to be busy (Nie at al., 2011).

5.4.3.2 Confidence

Another sub-theme of note within *Social Interactions* is that of *Confidence*. This included any reference to being shy, being afraid to post in a social context or just indicating a lack of confidence. References within this theme highlighted the fact that participants can be just as shy to display their thoughts and opinions in an online forum as in real life: "I did draft a document, but it was on a very different topic and I was too shy to post this!!"

The references in this theme uncovered one particular insights into why participants were hesitant to post, or didn't contribute at all: "hard to post when you don't feel you've cracked it!" This may be a key factor in encouraging discussion, should it be desired. Accessible learning has already been discussed, and this could be applied to social interactions just as well. How can *contributing* be made as accessible as possible? One way would be to mitigate the problem present in the previous reference by ensuring that students are asked to start posting *before* they've "cracked it."

5.4.4 Measures of Success

Measures of Success MEANS phenomena which suggest effectiveness or learning on the part of the course.

This theme is intended to uncover evidence of success on behalf of the BSL format and the ITC course itself. If indications of success can be found, then this provides further validation for the BSL method as an effective teaching tool, which should be developed further. Furthermore, if reasons for this success can be uncovered, then they can be developed and amplified within future courses, and these steps included

in an optimal model for BSL. Success within a course can come in many forms, from effective learning to engagement.

This measurement is key in answering the research questions stated in Section 1.4. Kirkpatrick's four level model of training evaluation (Kirkpatrick & Kirkpatrick, 2006), discussed in Section 2.2.3, informed the success measures detailed here, particularly levels one to three.

5.4.4.1 Enjoyment

This sub-theme, *Enjoyment*, is concerned with pleasurable feelings students experience when interacting with BSL based courses. It relates to any mention students make of positive emotional responses to the course, and the particular feelings range from normal enjoyment up to evangelism for the course format and topic. This theme may uncover reasons for enjoyment, which could inform future learning design, or it may simple serve as a measure of success for the format.

As a general measure, the word "enjoyed" appeared in six individual references, and positive emotions were evident within fourteen references. It is important, here, to distinguish between emotional responses and functional complements towards the course. The words which marked out the 14 previously mentioned references were "enjoy", "enjoyed", "welcoming", "engaging", "loved", "interesting" and "like". These indicate emotional responses. Functional complements, however, are covered in Section 5.4.4.3 below, and are indicated by words such as "useful" and "worked well".

In most cases, the participants did not elaborate on why they enjoyed the course. One individual did elaborate to state that they, "...enjoyed finding out about...", which seems to indicate simply that they enjoyed the learning process.

While this theme does not provide any deep insights into the reasons for enjoyment, it is a very useful measure of success within the course. If a participant enjoys the learning experience, then they are more likely to engage with the learning material. Engagement is, as has been discussed, a measure of success within this project as it has been shown to relate to effective learning in Section 2.7.

5.4.4.2 Change of Behaviour

This sub-theme, Change of Behaviour, demonstrates any evidence towards a change of behaviour in students, following participation in the ITC course.

Behavioural change is placed at level 3 of Kirkpatrick's model, and is a strong indicator of learning. Therefore, if there is evidence of changes of behaviour in BSL participants, this offers a strong suggestion that learning engagement is taking place.

Ten references in total indicated some type of change of behaviour which was attributable to taking part in ITC. For example: "Since getting to know how Evernote works, I now open it up when I come into the office". Measuring skill in the use of Evernote is difficult, but this quote evidences a regular change in behaviour thanks to course participation. Similarly, another participant related that they have "embraced Evernote in a big way in the last fortnight." This is further evidence of a change of behaviour, and success at Level 3. Furthermore, the first statement, "Since getting to know how Evernote works," indicates that the participant has achieved one of the key course outcomes: Ability to use Evernote in your own work. This confirms success at Level 2 of Kirkpatrick's model, specifically aimed at learning assessment, and so reinforces the learning indicated by the numerous references to changes of behaviour.

These indicators of success are not confirmation that BSL is more effective than any other mode of learning, but they do confirm that BSL is an effective teaching method, fostering engagement, and thus learning. When this measure of effectiveness is paired with the advantages of other BSL specific themes, such as Flexibility and Course format, it provides strong validation for the format as one which is an effective teaching method with advantages over alternative online course formats in a WBL context.

5.4.4.3 Effectiveness, Useful and Personal Attachment

Three sub themes which collected positive comments around the course were *Effectiveness, Useful and Personal Attachment*. *Effectiveness* and *Useful* collated statements which referred to those words in particular, or suggested the concept. *Personal Attachment* collected comments on how the course related to the individual in a positive way, for example: "it worked well for me." These references all provide evidence of a positive reaction to the learning materials, demonstrating success at Level 1 of Kirkpatrick's model.

5.4.4.4 Point of Confidence

This sub theme emerged from only one comment, but it raised a very interesting point and so is worth discussing, especially in relation to the concerns around retention in both BSL and MOOCs discussed in Section 2.3.4.

"I (subconsciously I suppose) felt I had covered the basics of all the tools, so had a bit of a steer on using them and could progress myself from there."

The concern over retention rates in open online learning is well noted, but detractors of this argument suggest that for many people, completion is not the aim. This comment confirms that idea; the learner in question used the course to gain enough

confidence so that they could progress on their own. This *point of confidence* is an interesting measure of success for any course as it may allow non-completers to, nevertheless, register as having been successful in their learning. It would seem that one way to provide a complete evaluation of a course is to assess how many people have reached this point of confidence.

5.4.5 Participation Patterns

Participation Patterns MEANS the changing frequency and volume of interactions that individuals have with the course, and the reasons behind this.

The *Participation Patterns* theme contains 3 key sub-themes, all related to the form and cause of each student's particular pattern. The first of these themes, and the most prevalent (31 references) is *Form of Participation*.

5.4.5.1 Form of Participation

Form of participation refers to the specific pattern of participation that the student follows throughout the course. These patterns can be seen to fall into 6 particular areas:

- Falling Behind
- Catching Up
- Falling Engagement
- Sporadic Involvement
- Did Not Finish
- Completed all Tasks

Falling Behind and *Catching Up* are strongly related, often mentioned in the same statement: "...I felt as if I was behind almost immediately because I had problems

installing the software and felt as if i was trying to catch up for the rest of the week." This reference states one reason for falling behind, but technology was not the only issue, and students also fell behind due to workload or general trouble with understanding the material.

Falling Engagement ties in strongly with these themes, as is evident in this reference: "Once you miss one day it can be very hard to re-engage as I discovered." This concept was mentioned by others and suggests that once a learner falls behind in this type of course, because it is quite structured, it is easy to become discouraged and simply stop engaging. This can lead to sub-theme 5, *Did Not Finish*. This is valuable as it suggests that structured courses, such as BSL, should look to engineer ways for students who fall behind to re-engage. Techniques which maintain the structure, but allow the missing of a day, or catching up of material at a later date, could be key in eradicating discouragement, enabling easy re-entry and maintaining participation throughout.

On the other hand, perhaps it's unrealistic to expect every unit of the course to engage learners, as highlighted by one participant who stated that their engagement "changed depending on the area we looked at and the usefulness to me personally." This represents *Sporadic Involvement*, and other reasons for this include busyness and workload in general. Similarly, busyness and workload were common reasons for falling into the *Did Not Finish* category.

5.4.5.2 Busyness

Mentions of the concept of busyness were prevalent enough to justify its own sub-theme, and it was the most commonly found barrier to participation. This is to be expected based on the typical view of a work based learner discussed in Section 2.4.

Eight references stated heavy workload and busyness as the reason that they didn't complete the activities.

The intention behind the BSL format is that it is accessible enough to take part in despite heavy workload. Flexibility is designed into the activities to enable this and short tasks create a very low barrier to entry. Therefore, mentions of busyness indicate that one of the primary aims of the learning design are not being achieved. In contrast, however, within the flexibility and measures of success themes, there are many positive mentions of the design. This suggests that the model does indeed allow participation for those that otherwise would be unable to, but that some individuals are either too busy to fit in even an accessible learning experience, or that they are unable to see the advantages of this method and take part. If the latter, then another component of the BSL model should be in highlighting these advantages, before helping learners to plan their learning, set priorities and ensure that workload is less of an issue.

One interesting concept to emerge from these references is that of increasing busyness through the week. The majority of references to busyness (six of nine in total) referred to an increasing workload towards the end of the week. This led to falling engagement with the course as normal work took priority. This suggests, firstly, lack of prioritisation of learning, which is an issue with the learner themselves. But, assuming that this effect is true, then it may suggest that the BSL model could work more effectively by tailoring materials to be more extensive early in the week, with an easier period towards the end. The model could include a day with no activities at the end of the week, designed for catching up, or to account for the fact that Fridays are very unproductive days for learning, due to other priorities.

5.4.5.3 Priority of Course

Prioritisation is mentioned within the *Busyness* theme, and takes the form of a theme itself. Priority is a prevalent reference, with many learners stating a similar sentiment to this quote: "My engagement dropped off towards the end because I suddenly had too much work to do and the course was lower on the priority/urgency list." Priority sometimes is not mentioned specifically, but phrases such as, "I think I'll do it later and then don't get there," suggest that it remains low priority compared to other tasks.

This highlights a particular disadvantage of online learning which may be even more important with respect to BSL: flexible, distance learning does not carry the same attention and urgency as face to face learning. This quote demonstrates these thoughts: "It was sometimes more difficult to clear out 30 minutes at the office - compared to physically attending a course when you are away from the office environment."

In a distance learning context, the flexible nature of the task causes it to be lower in priority, simply because it can be completed at any time. "...it's easier to push to the side about than a single block!!" as one participant said, comparing the small flexible tasks to one solid face to face learning session.

The daily delivery method within BSL is designed to overcome this disadvantage to an extent, creating a higher priority for smaller chunks of learning, e.g. this needs to be done today and it won't take long. But a disadvantage may come in the form of quantity of effort. This effort has to be made every day for five days, as opposed to the one-off inertia of getting up and attending one longer learning session.

Furthermore, short tasks may be easy to de-prioritise, or to put off, because they

may be perceived as less valuable. They may also be perceived as easier to catch up with, even though the references around *Falling Behind* and *Catching Up* prove this not to be the case.

5.4.6 Discussion

The qualitative analysis presented here helps to explain many of the trends found during the previous quantitative analysis. For example, the following:

1. The prevalence of the 'daily tasks' code and the specific feedback on how people enjoy short tasks seems to explain the higher than average engagement rate (as measured via analytics) with BSL as compared to other methods of online learning, such as MOOCs.
2. Point 2 in Section 4.3.2 hypothesises that a small core of participants provide a large proportion of contributions. The prevalence of negative codes in the 'Engagement Factors' theme seem to confirm that a significant number experienced enough problems to either cease participation or reduce it dramatically. This is highlighted by one response: "I tried to engage with the discussion forums...but not all of the participants were able to do so as much..." This data shows that there is a wide range of engagement, and that it affects the experience of even the most committed participants.
3. Furthermore, Point 1 in Section 4.3.2 seems to show a relatively consistent level of contribution throughout. But, the prevalence of the 'tasks are too long' code suggests that many participants struggle to keep up right from the start.

The following sub-sections will offer a summary discussion of each major theme.

5.4.6.1 Course Format

The first theme to emerge in this investigation, discovered through survey responses and subsequent coding and analysis work, was that of *Course Format*. Within this theme it was discovered that the scheduled daily tasks were advantageous and desired by the learner. It was also stated that the format, in general, "worked well" for many WBLs. Section 5.4.1.1 began to uncover that regular participation can be encouraged by daily tasks, offering low-barrier, easy access learning. This encourages the "plugging away" behaviour that was referenced. Next, Section 5.4.1.2 outlined that the daily activities allow "time to digest" the material, indicating that regular participation encourages reflection. Finally, Section 5.4.1.2 highlighted the habit that daily tasks build, and the rhythm that is initiated which may encourage more regular, and therefore higher, involvement with a course.

But, the format also carried some negative references. Firstly, in the context of ITC in particular, the tasks were too long. Secondly, even with manageable volume, participants expressed the opinion that very few would be able to participate every day, and that *falling behind* and *catching up* are real barriers to learning.

Possible solutions for this could include retaining the daily tasks, but ensuring the time required is very short. An alternative would be lengthening the course itself, and running tasks at a less regular interval, such as every 2 days. This is something which was suggested by learners within the *Duration of Learning* sub-theme.

The social contribution aspect seemed to have a large part to play in the problem around time-estimates, reportedly being the most time consuming, but least directly rewarding component of each task. Therefore, work needs to be done to evaluate the place of social within a short, structured format, like BSL.

Another prevalent theme within Course Structure was that of Face to Face Support. The conflict between flexibility and strong support was apparent here. Student desire maximum flexibility, but also express a need for instantaneous support. Without provision for 24/7 support staff, which is very unlikely in any context, these are in opposition. Lengthening the course may solve this problem to an extent, allowing more time for asynchronous support for each individual task, and so this could be considered further justification for trialling the *1 task every 2 days* format.

Overall, the volume of positive comments on the course format in particular, and on ITC in general, were seen to validate the BSL format as an effective step in developing more effective work based learning. Participants confirmed that the format is more accessible and effective than traditional one-off learning interventions. The quantitative data discussed in Section 5.2 displayed the engagement patterns present, but only qualitative data could explain whether this engagement was positive enough to justify the use of the format.

5.4.6.2 Flexibility

Second to course format, flexibility was the next more prevalent theme. Flexibility was broken down into sub-themes which included time, location and order of consumption. Firstly, the prevalence of references to flexibility, almost exclusively in a positive light, justify the focus on this in the design of BSL. Referring to the literature (Brennan, 2005), this is a key requirement for work based learners, and that was borne out in this research.

Time flexibility seems to be key in facilitating professional development, allowing WBLs to participate despite heavy and unpredictable workloads. It was interesting to

note, as well, that participants found it valuable to be able to "dip in" at more than one point in a day, which also might allow reflection time between these interactions.

Location flexibility was found to be almost as important; the participants in ITC noted various working locations, which changed throughout the day and the week.

Finally, order of consumption was referenced on a number of occasions, and some participants went back during courses to consume materials in various configurations.

Since flexibility is such an important factor, and participants may desire a flexible order of consumption, this causes conflict with the daily delivery format. Daily delivery precludes any choice in order of consumption, and ties the participant to particular days for particular tasks. Participants stated that "worry" existed over keeping up or "falling behind," due to this structure. This raises the question over whether the daily format should be removed to increase flexibility.

This author would argue that further investigation into the balance between daily format and buffet delivery is warranted. As discussed in Section 5.4.1.2, there is evidence to suggest that the daily task structure provides effective motivation to participate regularly and to build a habit of learning, as opposed to more flexible online courses where everything is available at once. The tendency in the latter may be to leave a large amount of work until the last minute, leading to incompleteness. Daily delivery, on the other hand, could encourage regular participation in accessible tasks which allow the participant to stay *caught up* and, as stated by one participant, "definitely motivate me to plug away at it." This theory is backed up by the literature (Salmon, 2004), lending support to further investigation.

5.4.6.3 Social Interaction

BSL was designed with social learning in mind due, in large part, to the benefits highlighted by Lave & Wenger (1991) when discussing communities of practice as well as the benefits of a social group in a constructivist learning setting. The results showed a significant positive response to this social aspect, but tempered by an equally significant range of negative references.

The main argument against inclusion of a social component is time: a large proportion of participants found it too onerous to take part in any volume, if at all. It is likely that social participation will be the first component to be dropped by a participant when they become time-pressed. Social participation produces the least tangible reward, compared to consuming learning materials and putting them into practice within a work setting. This lack of social participation occurred within each instance of ITC and resulted in quiet discussion forums which are very ineffective at either encouraging participation, or promoting group learning.

It could be argued that for optimum accessibility and minimum barrier to entry, social collaboration should be removed from the method. The feedback shown earlier demonstrates that it was more onerous than other elements of the tasks, and produced negative feelings and discouragement when it was missed due to time constraints. On the other hand, it is clear that the time required for ITC tasks was not judged correctly and so social participation may be possible, and beneficial, in a more accurately timed task.

An alternative may come in the form of optional participation in social activities. This could remove the negative feelings over missing out or "falling behind" while retaining the option to participate for those that might benefit. This may simply cause

silent discussion boards as every busy WBL takes the option to save time, but this could be a worthy experiment in itself.

Overall, the positive comments around discussion, allied with robust literature on the subject, and the possible contribution of inaccurate time estimates to its failure, leads this author to believe that it is worth including in the next stage of testing. It may be that it transpires that one element of social participation can be removed, e.g. peer to peer, while another is retained, e.g. peer to tutor, and that would provide a balance between community, support and time commitment. It may not be possible to cover every aspect of the social presence discussed in Section 2.2.1 (Garrison & Cleveland-Innes, 2005), but retaining at least one part of it may be beneficial on its own.

5.4.6.4 Measures of Success

In the context of this project, the *measures of success* theme addresses research question 2 (Section 1.4) and helps to validate BSL as an effective, and sometimes advantageous, teaching method.

When changes of behaviour and opinions around effectiveness and usefulness are evidenced, it confirms the method as a legitimate promoter of engagement and learning.

Next, feedback on the unique elements of the course format start to suggest whether the method is more effective than others. For example, participants state that the flexibility present in BSL allows them to participate when standard face to face workshops wouldn't, and this is followed by evidence of a change of behaviour in some participants. The combinations of these outputs suggest that BSL is a convincing learning method which is more effective for those learners than other

methods. This provides a positive answer to research question 2 within the higher education context of ITC, and versus traditional *one block of learning* methods, either face to face or online.

5.4.6.5 *Participation Patterns*

Participation in BSL, ideally, should be pre-determined, with learners taking part in each task on the day it is released. The *Participation Patterns* theme, however, showed that many factors determine real-life patterns, and they can be far from ideal. As discussed, the daily structure incorporating short tasks is intended to make participation as decision-free and accessible as possible, building habit and lowering barriers. Despite this intention, participation was often still sporadic, delayed or non-existent. Reasons for this and possible solutions have already been discussed, but one thought to add within this theme is the idea of re-entry or re-engagement points. This concept was mentioned within the *Form of Participation* section, the intention being to reduce the effort for any learner to re-join a course in which they have *fallen behind*.

Re-entry points may take the form of sequence breaks, for example. This may take the form of a task which is unrelated to the previous 1 or 2 tasks and so can be completed without going back to complete previous work. This allows the student to jump straight in, achieve a small reward and either go back to complete previous work, or continue from there.

An alternative may be to include an 'extra credit' task every 3 days which is extraneous to the main flow of learning. This task must be valuable enough to learners so that those who are *Caught Up* can complete it and benefit from that action. It must also be superfluous enough to the main course aim that it's safe to

miss entirely. It would be made clear on the day of delivery that this can be taken as a catch up day, so that *Falling Behind* students can use this day to catch up if necessary. This should reduce the barrier to re-entry without disadvantaging other learners.

5.4.6.6 Priority of Learning through Gamification

One element of the *Participation Patterns* theme which is worth discussing alone is *Priority of Course*. This concept was highlighted earlier as a weakness of distance learning in general and BSL in particular as a consequence of one of its core strengths, flexibility. Flexibility naturally brings with it the perception that flexible materials are easy to "push to the side."

The daily format was discussed as one possible way to mitigate this effect. The smaller tasks and the more rigid structure can be seen to motivate users to "plug away" at the tasks, and not to postpone learning. But, the over-long task lengths perhaps overrode this effect to an extent within the ITC course, creating enough of a barrier to learning to negate the effect.

This is one area that should be explored in the next stage of the project. A comparison between daily delivery and its alternatives will be very useful, especially in a context where task lengths are judged correctly so that daily delivery is given full opportunity to benefit the learners.

Even if daily delivery is one way to help raise the priority of learning, other ways should be found to give courses higher priority, or to make the motivation to participate greater. One possible method for this is gamification, an approach which can help to persuade learners into regular participation. An investigation of gamification is beyond the scope of this work, but it is felt that this would be a high

priority for future work within BSL. Gamification, even simply in the form of peer-viewed progress tracking, could provide a significant boost in course priority.

5.4.6.7 Towards a Model of BSL

While the problems associated with underestimated task lengths make it difficult to draw definitive conclusions, this author would suggest that a combination of flexibility, low inertia and structure may provide a model for more successful WBL. Flexibility allows participation despite busyness. Short tasks reduce the inertia barrier in getting started. And a daily structure motivates people to stay involved and not *push aside* their learning.

It could be stated that accessibility covers the former two points, and provides a good overall description of what the BSL format aims to provide. Increasing flexibility makes a course more accessible for any participant, as they can *access* the material in any place and at any time. Short tasks then lower the inertia around accessing the material in question, reducing those barriers to learning in the participant's mind. The buffet model clearly offers maximum accessibility, but as mentioned above, combining accessibility AND structure may provide an optimum balance. The positive comments towards the daily format, and the evidence provided around its ability to instil learning habits and priority are compelling. This is something that will be explored further in the next stage of this work.

5.4.7 Limitations

Despite work done to mitigate the risks as much as possible, thematic analysis is always a subjective process, at least in part. The themes and codes discovered during this work may have emerged slightly differently under a different author.

This study was conducted over six separate course instances. While every effort was made to deliver each course in the same manner, the delivery may have differed slightly each time, even if just in participant contributions. To mitigate the effect of variations between courses, themes were, unless stated otherwise, only developed when they appeared to refer to the general course format rather than particular details of that instance.

The data may provide more rigorous results with the inclusion of more learner responses, but this work was carried out within active courses on the Edinburgh Napier staff development programme. This means that participant numbers were not controllable and data was collected in the best way available.

5.5 Stage 1 Discussion

5.5.1 Mixed Methods Analysis

Mixed methods research allows the researcher to draw together qualitative and quantitative data in order to explore and explain phenomena. In this case, learning analytics formed the quantitative data, while survey responses formed the qualitative data. This section intends to combine both sets of data to draw further insights into the research questions outlined in Section 1.4.

Participants vs Consumption

In Section 5.2.2 two options were discussed to explain a lower drop in daily participants than consumption: 1. Participants have less time to spend on the course as the week progresses. 2. Participants don't find value in tasks and cease to participate at a certain point in the course.

The data discussed in Section 5.4.4.3 showed that participants overwhelmingly thought the course material was successful, quoting such phrases as “useful”, “interesting” and “engaging”. This suggests that proposition 2 above is not true. Later, in Section 5.4.5, the overall form of participation was covered, and concepts of busyness arose. These suggest that proposition 1 above is true, and increasing workloads explain the patterns of disengagement found at various points in the week.

Patterns of Engagement

One element where the quantitative data brings insight to the qualitative statements is in the patterns found in engagement.

Sporadic involvement was mentioned in Section 5.4.5.1 by one user, and the data shows that this is a prevalent pattern. Many users who miss one or two days during the week still make it to the final day of material. This suggests that a proportion of users are picking and choosing which days to participate in, and not experiencing the discouragement related by some references within Section 5.4.6.5. This could be seen as further evidence to trial a buffet model approach; survey data suggests that it could be beneficial and analytics show that many participants are not attending every day. It remains to be seen whether the problem associated with underestimated task lengths may have contributed to this sporadic involvement within ITC. A comparison between daily delivery and buffet may bring forth a truer picture of the relative strengths and weaknesses when task lengths are accurately measured.

Transitioning from Auditing to Completing

Finally, an area of interest within the quantitative data was the binary nature of Completing and Auditing. The data suggests that the proportion of disengagers is relatively stable between course instances, but that completers and auditors were always in opposition, e.g. When completers are high then auditors are low and vice versa. The middle ground did not seem to exist. This means that completion numbers are always either quite low, or quite high.

It is possible that the trends discussed in Section 5.4.3 could explain this. As discussed, completions take the form of discussion postings within the course. These form the task output and showcase a higher level of engagement through interaction with peers or the facilitator. Within Section 5.4.3.1, references made it clear that the social element was neglected by many students, even though others found it very valuable. On the courses with high completions the social component was naturally more active, due to the nature of the task output. It seems possible that, in becoming more active, a course instance may be achieving a certain tipping point, and this then encourages more students to *complete* also. That snowball effect encourages more interactions, and more task output. Therefore, to create a BSL course with more high-level engagement, the barrier to task completion must be kept as low as possible. In the case of ITC, when task completion is achieved simply by posting feedback in the forum, this means being very clear with what to post as the output of a task and keeping it as simple as possible.

A further finding is that this suggests that social interaction should be retained on the course, if possible. This is contrary to some elements of Section 5.4.3 where it became clear that social interactions were difficult to encourage and often a key cause of “falling behind”. As discussed earlier, the daily format encourages the

completion of tasks by keeping them small, regular and achievable. The *Form of Participation* theme also made it clear that incomplete tasks lead to discouragement, and a tendency to drop out. So, completing a task is conducive to completing more tasks. Therefore, if social interaction tends to breed more interaction, and that interaction breeds more engagement, and more completions in any given day, then it could also encourage continuous participation throughout the week.

5.5.2 Mixed Methods to Provide Rigour in Educational Research

The author believes that a mixed methods approach, triangulating via quantitative and qualitative analysis, is highly advantageous for robust evaluation in a learning context. Qualitative data provides excellent participant feedback on aspects of the course, and suggests improvements for the future. But, alone, it doesn't give as robust a measure of current levels of satisfaction as that provided by a combination of qualitative and quantitative learning analytics data.

Conversely, increased engagement alone, as measured by learning analytics, may be a misleading measure of success. Only by combining that with qualitative data can it be determined whether it is an increase in *significant* engagement, or related to greater satisfaction in the course.

It was found during stage 1 of this study that one method alone can lead to quite misleading findings. Quantitative data, for example, suggests that there are no problems on the ITC course concerning contributions - even if consumption drops over time, participants are still contributing to the course. Participation numbers suggest this isn't the case, of course, but only the addition of explanatory qualitative data leads us to the root of the problem, which seems to be two-fold: 1. Tasks were

too long, and don't allow for significant contribution after the task, and 2. Workload, particularly unexpected work, gets in the way, particularly later in the week.

Another perceived advantage of this type of mixed methods approach is its ability to uncover and explain discrepancies between quantitative measures and qualitative responses. This is a manifestation of the difference between what participants 'say' and what they 'do'.

During a purely qualitative study, in learning in particular, many students may claim to do a certain amount of work, or behave in a certain way, but, in reality, do not live up to those 'aspirational claims'. By combining learning analytics and course feedback surveys it is possible to uncover these discrepancies, and explain how they arise. This may lead to theory-based solutions which improve the learning experience and allow participants to live up to their 'aspirational claims'.

5.5.3 Follow-On Experiments

The next step in this research is to design stage 2, the Teaching Format Experiment, using the base provided by this Teaching Format Snapshot.

Based on the findings within this stage of the research, the following experiments are suggested for future work, one of which will be carried out and described within the remainder of this thesis. These experiments may uncover improvements to the BSL method based on the Teaching Format Snapshot, and would certainly test the effectiveness of these improvements in practice.

Firstly, in order to truly evaluate the effectiveness of the daily tasks format, a test will be run comparing the daily delivery format to a buffet model course of the same content. This is intended to test the suggestions of a number of participants around

greater flexibility, removing the daily structure constraint and allowing the student to participate through the week in the manner in which they choose. This would also test the effectiveness of the daily tasks in building habit, increasing priority and encouraging longer participation.

Next, it would be interesting to test two identical courses delivered over different durations and with different task frequency. For example, the current ITC course format could be tested against one which is 2 weeks long, and tasks are delivered every 2 days. This would assess whether more time per task would reduce dropout due to "falling behind", whether it would encourage more social interaction, and whether it would lead to less concerns about asynchronous support. The experiment could also assess whether a less regular task actually loses its habit building potency, its level of priority and therefore results in lower retention.

Next, it would be interesting to test the idea of re-entry points which was proposed in Section 5.4.6.5. A course could be designed to include sequence breaks, catch-up days and other methods for allowing easier re-entry to the material. This would then be tested through both analytics and survey data with the aim of discovering any change in learner attitudes towards *Falling Behind*.

Finally, it has been stated that flexibility may increase the tendency to "push to the side," learning, and lower its priority in a busy work schedule. One possible method to increase priority and motivation is gamification. Using gamification, it may be possible to make learning progress much more visible, and thus rewarding, both to the learner and their peers. If it is made obvious to the learner what they have completed so far, what they have missed, and what progress their peers are making, then this may raise the priority for participation in their own minds. A complete

mind-set, promoted by gamification, can help to keep this priority high, as can competitiveness when comparing oneself with peers.

5.6 Conclusion

This chapter completed the first stage of the three stage theory building process outlined in Chapter 3, providing a Teaching Format Snapshot to work from. A mixed methods analysis was carried out, combining learning analytics and qualitative survey data to provide a baseline measure of the student perceptions of and interactions with the BSL method.

The next stage of this research is to carry out an experiment based on the theory which emerged from this chapter. As discussed in Section 5.5.3, the emerging theory suggests a number of experiments and possible improvements which could be taken forward to the Teaching Format Experiment in the next chapter.

The running of each suggested experiment is out with the scope of this research due to timescale limitations. Therefore, the experiment which will be taken forward to Stage 2 and form the basis of the Teaching Format Experiment is the comparison between daily delivery and buffet.

This experiment was chosen because the daily delivery method was core to the initial design of BSL. If it is, in fact, not the optimum delivery method for the learning design, then other potential improvements will be stunted by this disadvantage. One of the alternatives from the previous section, an experiment which tests task frequency, may have a similar result, but this would simply test a variation of one method, rather than comparing two different methods. Therefore, Buffet and Daily delivery will be compared side by side within the Teaching Format Experiment.

6. Teaching Format Experiment

6.1 Introduction

During stage 1 of this project, the Teaching Format Snapshot, the primary aim was to move towards addressing research question 2, and begin to ascertain the current status of Bite Sized Learning (BSL) in terms of strengths, weaknesses and efficacy. The research showed that BSL has unique strengths in the Work Based Learning (WBL) context, enough to justify its use in this area and to prompt further development of the method. The research also showed that there are a number of areas in which BSL could be improved, and revealed uncertainty around the success of the daily delivery aspect of the method in particular.

This chapter will relate the results of an experiment which intended to test an instrument in improving the BSL format. The chapter comprises stage 2 of the methodological model discussed in Chapter 3, labelled the Teaching Format Experiment.

The experiment chosen, as discussed in Section 5.6, compares daily delivery of tasks to a buffet model of delivery (Twigg, 2003). The daily task delivery process is a key component of BSL currently, based on both previous research (Salmon, 2004) and now supported by evidence discussed in Section 5.4.1.2. It is felt to build the habit and increase the priority of learning, while helping to lower barriers. However, as revealed in Section 5.4.6.2, there is evidence to show that some participants may see this as a reduction in flexibility, and that it may be more advantageous to allow access to all materials throughout the course. This would allow more flexibility to the participants, particularly in order of consumption.

The aim of this experiment is to further explore research question 2: Does bite sized learning promote greater engagement with learning in academic work based learners than traditional professional development methods?

This exploration began in the previous chapter by producing the Teaching Format Snapshot, and continues in this chapter through experimentation.

In order to further explore research question 2, it is broken down into two sub questions for use within the Teaching Format Experiment and the Teaching Format Theory. These questions separate regularity of involvement from volume of involvement and they specify the comparison between BSL and more traditional learning within this experiment. While buffet learning is not traditional learning, as such, it is felt to be more akin to common methods than the daily approach which BSL employs. For clarity, the sub-questions are labelled 2.1 and 2.2, referring to their roots in this work's second research question. Assuming a context of work based learners in an academic setting:

2.1 - Does daily delivery of tasks encourage more regular involvement, and hence engagement, than buffet learning.

2.2 - Does daily delivery of tasks encourage a greater volume of involvement, and hence engagement, than buffet learning.

The hypothesis surrounding these questions is as follows:

Two courses will be created, identical in content, but varying by course format. When comparing these courses, the motivation they provide to the learner to participate will vary, and result in different patterns and volumes of involvement.

Use of Data within the Teaching Format Experiment & Teaching Format Theory

Research questions 2.1 and 2.2 contain both a quantitative and a qualitative aspect.

Within this chapter, the experiment has been designed based on the qualitative data sourced within the Teaching Format Snapshot. In order to explore this experiment, a quantitative measure of involvement will be used to directly compare engagement trends between the two groups of learners: daily delivery and buffet delivery. This represents the sequential exploratory strategy of the Teaching Format Experiment, exploring the effect of the daily delivery instrument. This gives us a measure of how effective, or not, the daily delivery instrument is.

As discussed in Section 3.5, the sequential exploratory strategy represents stage 2 of this research, the Teaching Format Experiment, and overlaps with Stage 1, the Teaching Format Snapshot. This overlap is demonstrated in Figure 5 and outlined in Figure 4.

Stage 3, Teaching Format Theory, will follow in the next chapter, and will answer the qualitative aspects of research questions 2.1 and 2.2. The Teaching Format Theory, in a similar approach to the Teaching Format Snapshot, will draw from the quantitative results of this chapter, the Teaching Format Experiment, and explain them using qualitative feedback.

To be clear, the overlap shown in Figure 5 between Stages 2 and 3 is the Quantitative data sourced during this experiment. That quantitative data will be taken forward to the next chapter and used as a basis for the qualitative analysis found there. During that process, theory that began to emerge at the end of stage 1 will be

further refined and solidified into general theory for the learning format. This will then be solidified within a theoretical model for BSL later in the thesis.

6.2 Course Context

6.2.1 Course Details

This experiment was carried out twice, using four instances of the course in question, comparing two instances within each experiment.

The course which hosted this experiment was called *Making Magic with Moodle (MMWM)* and was intended to teach higher education staff how to develop more accessible, usable and attractive Moodle courses. Lessons included such topics as *Using Icons to Make Learning Materials More Readable* and *How to Structure a Moodle Course for Usability*. The course was one week in duration and included five x 30 minute tasks in total. Examples from this course are shown in Appendix B.

6.2.2 Course Participants

This course was aimed at Higher Education staff and was open to anyone in that industry. It was advertised on the SEDA (Staff and Educational Developers Association) mailing list at the start of April 2014, inviting anyone who was interested in the subject to take part. This mailing list is of interest to any professional development staff working in Higher Education, particularly in the UK, but also internationally.

79 participants applied to take part in the course in the first 3 days, and applications continued to come in at a slower rate for weeks and months afterwards. In choosing group size for these experiments, the main factor was support workload. Previous courses, as described in stage 1, ranged from 7 to 18 participants, and these were

found to be very manageable in a limited workload. Scaling this up, it was decided that it would be possible to support 60 students in an effective manner, and this would produce a maximum course size of 30 participants. It was expected, in reality, that active participant numbers would actually be significantly lower than that, and so would be comparable to the participant numbers described in stage 1.

Prior to the first run of this experiment, the first 60 applicants were split randomly into two groups of 30, and enrolment invites were sent to each group. The enrolment invites directed participants to enrol on one of two courses, each of which has been set up for a particular group of 30. The course content was identical for each group, but differed in delivery format. The control group were enrolled in a standard BSL course, which employed a daily delivery of tasks. The treatment group were enrolled in an alternative format BSL course which delivered material in a buffet format, i.e. everything is available from the beginning.

For the second run of this experiment, the next 60 course applicants were split randomly into two groups, and enrolment invites were sent out to each group, directing one group to the daily delivery course, and the other to the buffet model course.

The table below shows the course instances which were run and eventual enrolled participant numbers.

Group Designation	Course Date	Delivery Method	Participants
April Daily (AD)	7th to 11th April 2014	Daily	23
April Buffet (AB)	7th to 11th April 2014	Buffet	22
June Daily (JD)	June 2014	Daily	14
June Buffet (JB)	June 2014	Buffet	7

Table 5: Course Participants in the Daily Delivery vs Buffet Method Experiment

Table 5 shows that the first run of this experiment achieved a very high rate of enrolment, attaining 23 participants for the April Daily (AD) group and 22 for the April Buffet (AB) group. The second run of the experiment, however, achieved a much lower rate of enrolment. It is likely that this was due to two factors. Firstly, the invite and the course need was not as fresh. 2 months had passed since participants had signed up for the course and so those needs may have passed. Secondly, in June many academic staff start to take academic holidays and so a number of possible participants may have been unable to take part. In any case, participants' numbers in the June courses were similar to those set by the original ITC courses, and so are considered to be equivalent.

6.3 Method

The MMWM course was delivered on a Moodle platform located at TELTeacher.com. Each instance of the course was delivered separately, creating four course instances in total.

In order to analyse the learning analytics, data logs were extracted from each MMWM course instance, and processed as described in Section 4.3. This processing produced charts which display usage trends, and statistics to describe the patterns of participant engagement.

6.4 Results

6.4.1 Learning Analytics Output

As detailed in Chapter 4, the most reliable method of measuring involvement was found to be through number of participants. To that end, the following diagrams show participant engagement trends over the five days of both April and June course instances.

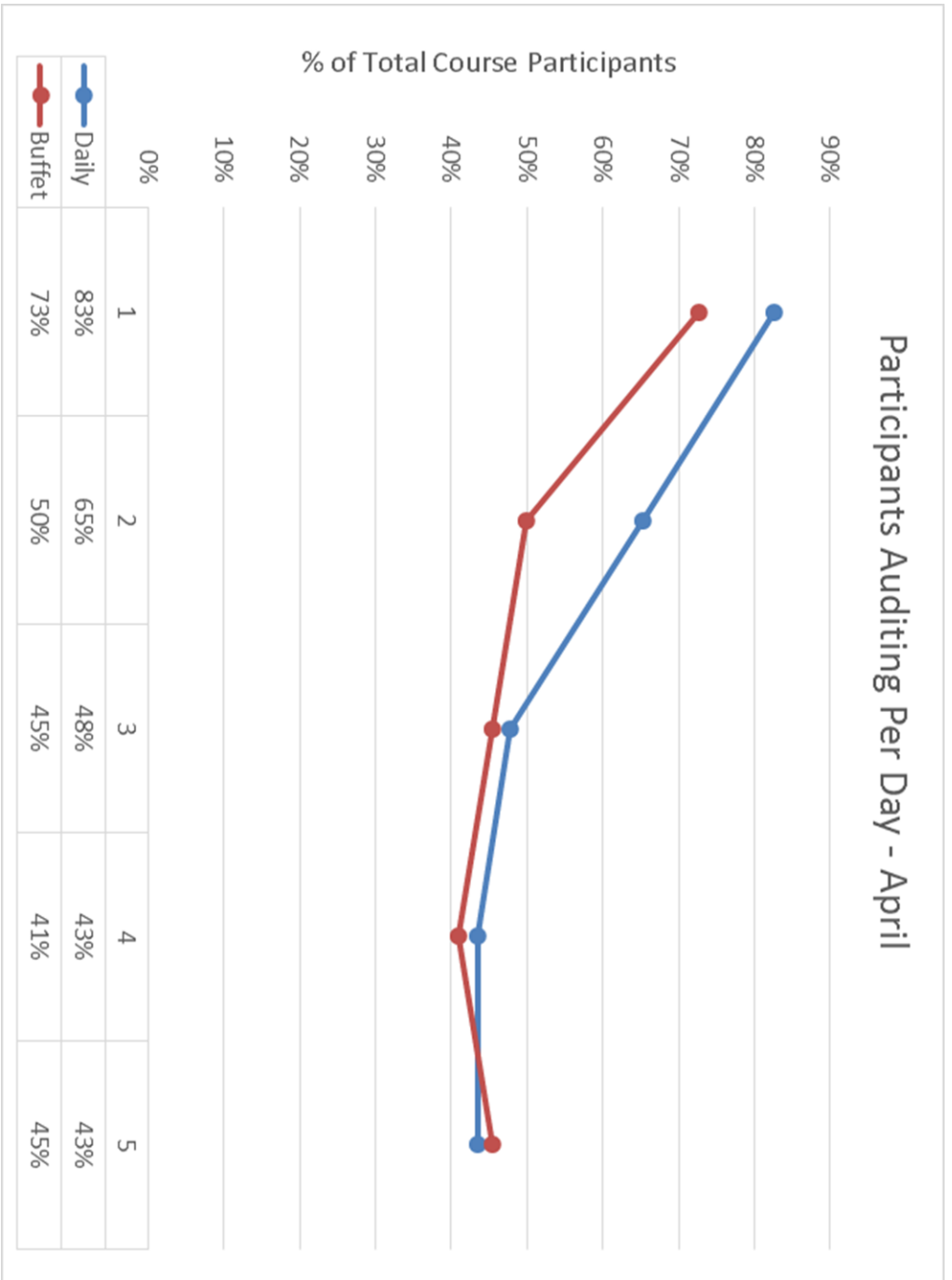


Figure 15: Participants taking part in auditing activity on each day of the April instance of MMWM.

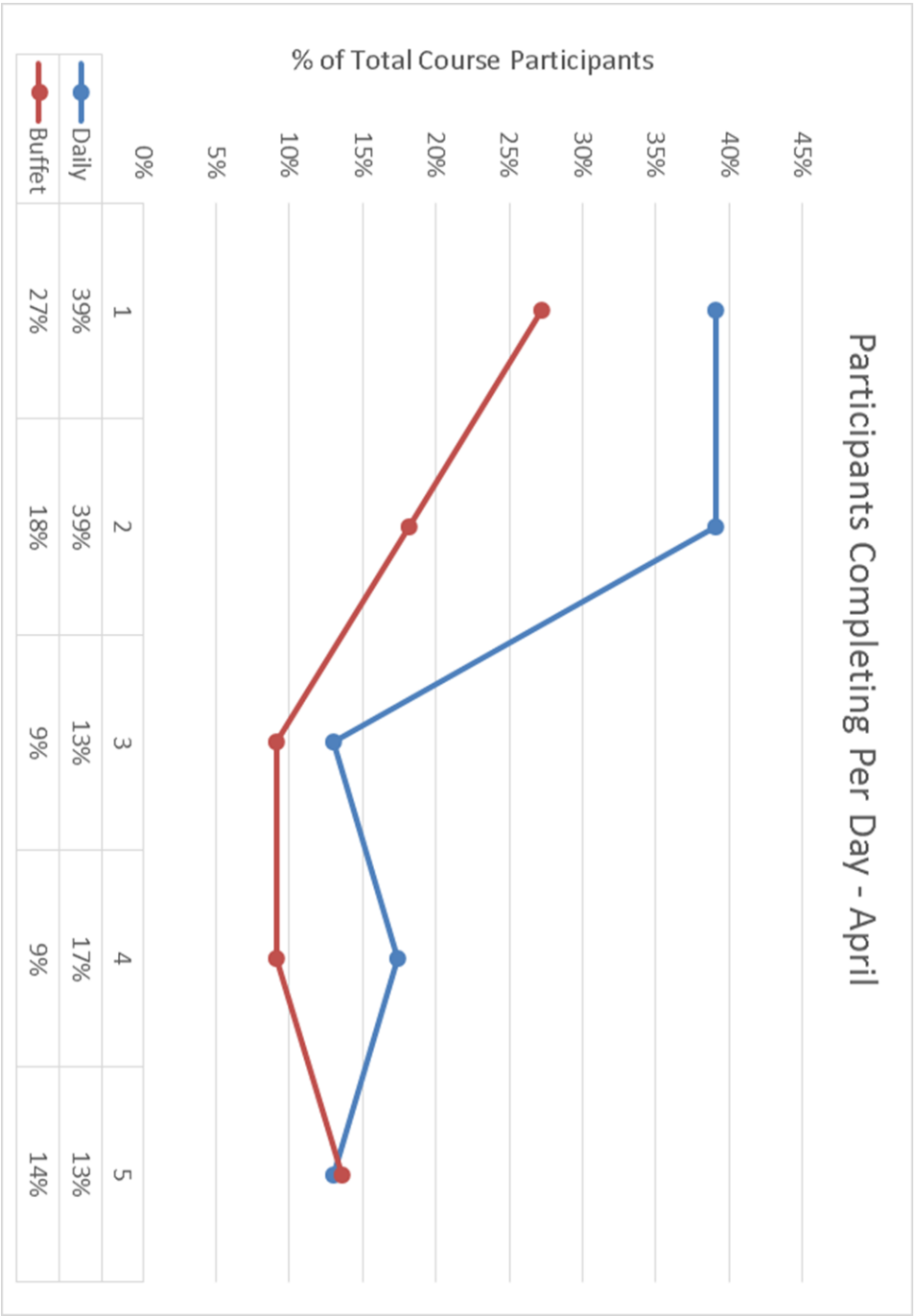


Figure 16: Participants taking part in completing activity on each day of the April instance of MMWM.

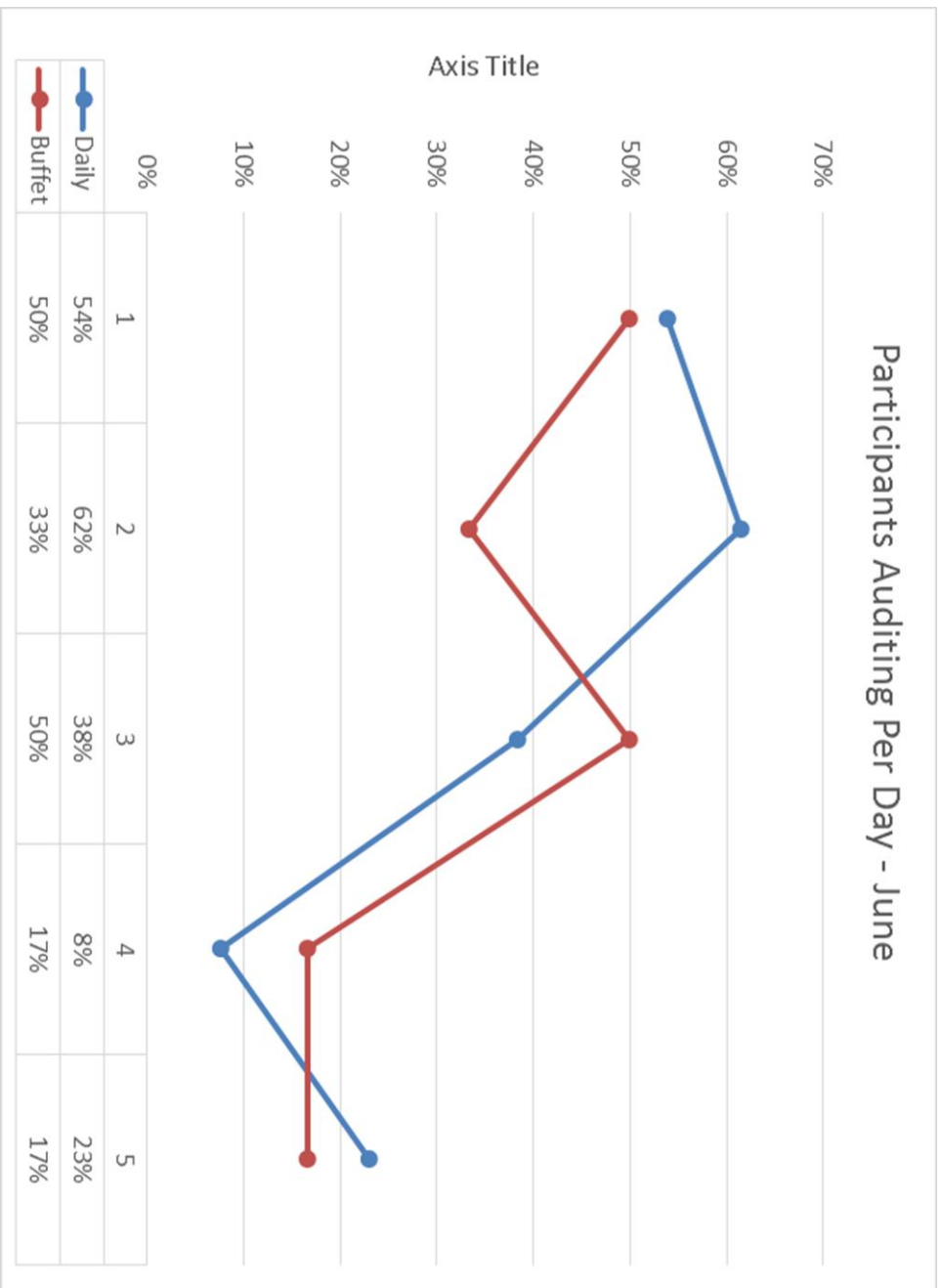


Figure 17: Participants taking part in auditing activity on each day of the June instance of MMWM.

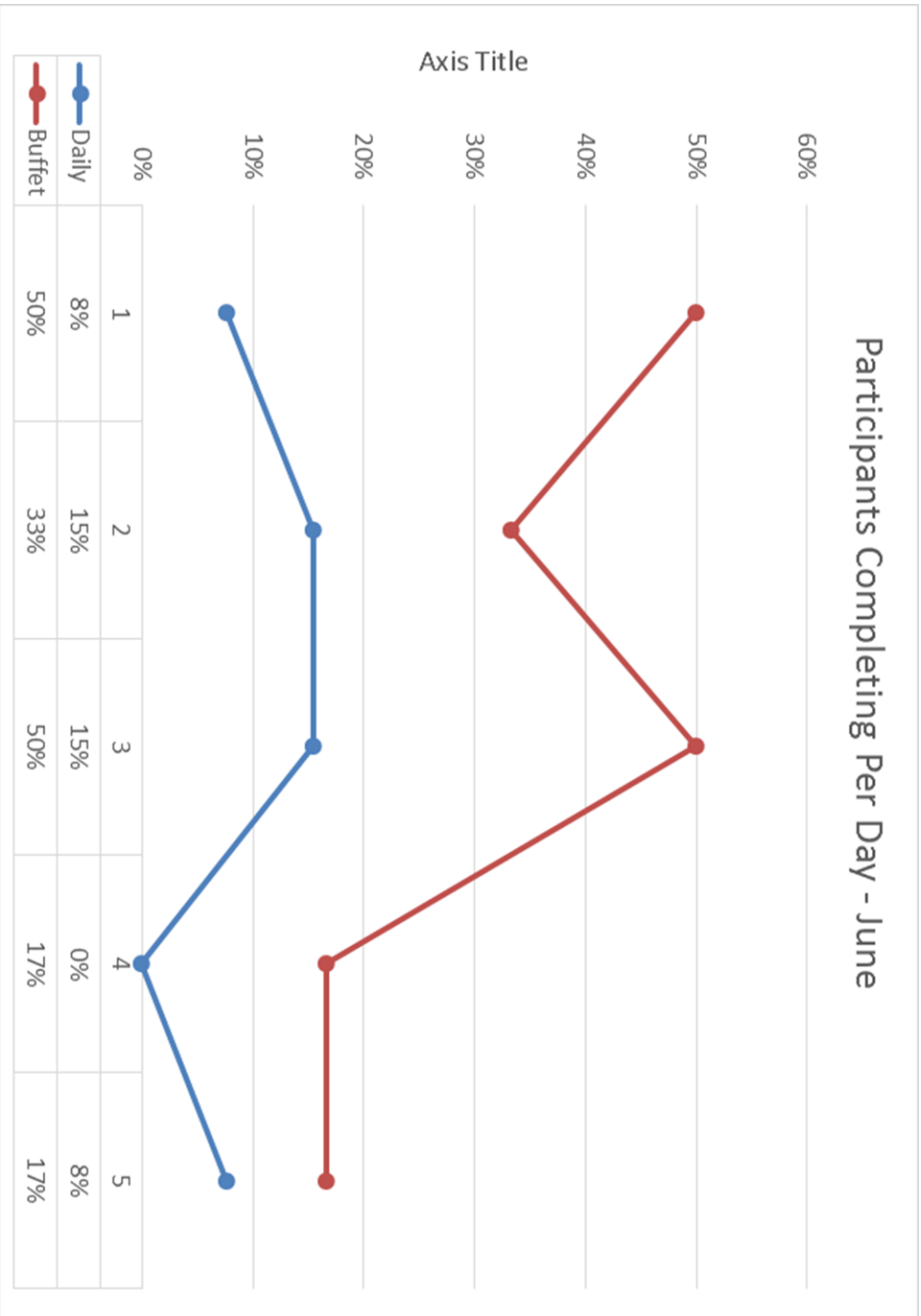


Figure 18: Participants taking part in completing activity on each day of the June instance of MMWM.

It is thought that the June sample size is too low to make useful quantitative comparisons. The daily intake achieved 14 participants, but the Buffet instance had only half that at 7 participants. A x2 difference would seem to be too large a disparity for comparison. The April instance, however, has a much healthier sample size, and a much closer range for comparison with 22 and 23 participants for buffet and daily respectively.

6.4.2 Comparisons in Participant Numbers

The first item to note from the data is that there is a trend towards auditing numbers to be very similar between daily and buffet on the first day of the course. Then, on the second day, buffet delivery has a more significant drop than daily delivery. This seems to encourage the hypothesis that without structure, buffet model participants are not encouraged to keep participating each day and this may lead to *falling behind* and *drop out*. The daily delivery structure, on the other hand, is seen to encourage participants to stay more regularly involved.

From the third day onwards, however, auditing in April is nearly equal, differing no more than 3% between daily and buffet.

When looking at completing activity in Figure 16, the difference is more marked. Daily delivery shows steady numbers of participants completing through days 1 and 2 at 39%, while buffet starts at 27% and drops to 18%. This decline continues to 9% and levels off, while the daily delivery course completions drop significantly on day 3 to 13%, so that buffet and daily are almost equal half way through the course. For the final 2 days, completion activity is similarly low between both courses.

Looking at the trends displayed by the analytics, it certainly seems that the daily delivery format is encouraging more participation in the first half of the course.

However, the difference is not dramatic, and activity is at the same level as buffet delivery by the final day, both in auditing and completions. While it appears that daily delivery does have some advantage over buffet in terms of regular involvement, thus answering research question 2.1 to the affirmative, the lack of reliable results from the June instance precludes full statistical analysis to confirm the significance of this difference. It was hoped that the June delivery would add rigour to the results, allowing a statistical comparison, such as t-tests run per day, or a MANOVA, but the lack of participation renders this impossible. It would be very desirable, in future, to run this experiment again with further groups in order to provide a larger set of data on which to run statistical analysis. This would allow the drawing of more rigorous conclusions where even a small percentage increase could be a successful result for the daily format.

Again, the results cannot be statistically confirmed from this quantitative data alone, but to address research question 2.2, the total volume of auditing activity is greater under the daily delivery format than with buffet delivery: 57% vs 51% as a percentage of the maximum possible participation. Daily also has an advantage in completion activity with 24% vs 15%. If these are statistically significant differences, then 6% is a valuable gain in terms of increased participation but, again, more runs of this experiment are required in order to carry out that testing.

In any case, this is a mixed methods experiment and so while this analysis would not stand on its own, it will provide a valuable triangulation when allied with the qualitative analysis to follow. Even at this stage, when adding in the theory developed during the Teaching Format Snapshot, there is more validity to these results. The theory expected that daily delivery may hold an advantage over buffet,

and the quantitative data bears this out, even if it can't be confirmed statistically. This is one advantage of mixed methods in that it can provide support to claims where numerical data alone is insufficient.

One possible flaw in this method is that, on the buffet course, it is possible for participants to complete every activity in one day. This would mean they were registered as a one-off visitor, despite the fact that this could be considered successful. If this was the case, then the buffet course would have seen equal or higher volumes of activity overall, compared to the daily format. This could be negated by tracking the completion of individual tasks, as opposed to completion of days and is something that would be suggested within future work. In the case of this course, it was not possible to track individual tasks, but methods could be developed to allow this within the Moodle logging environment.

6.4.3 Revisiting Participant Categories

Because the results discussed above are not statistically significant, it is thought to be worth revisiting the participant categories method explored in Section 4.4.3. It may be that these can provide extra information which help to triangulate reliable conclusions, especially when combined with the forthcoming qualitative analysis.

Participant data was processed as described in Section 4.4.3 to place all students into categories related to their participation volume and type.

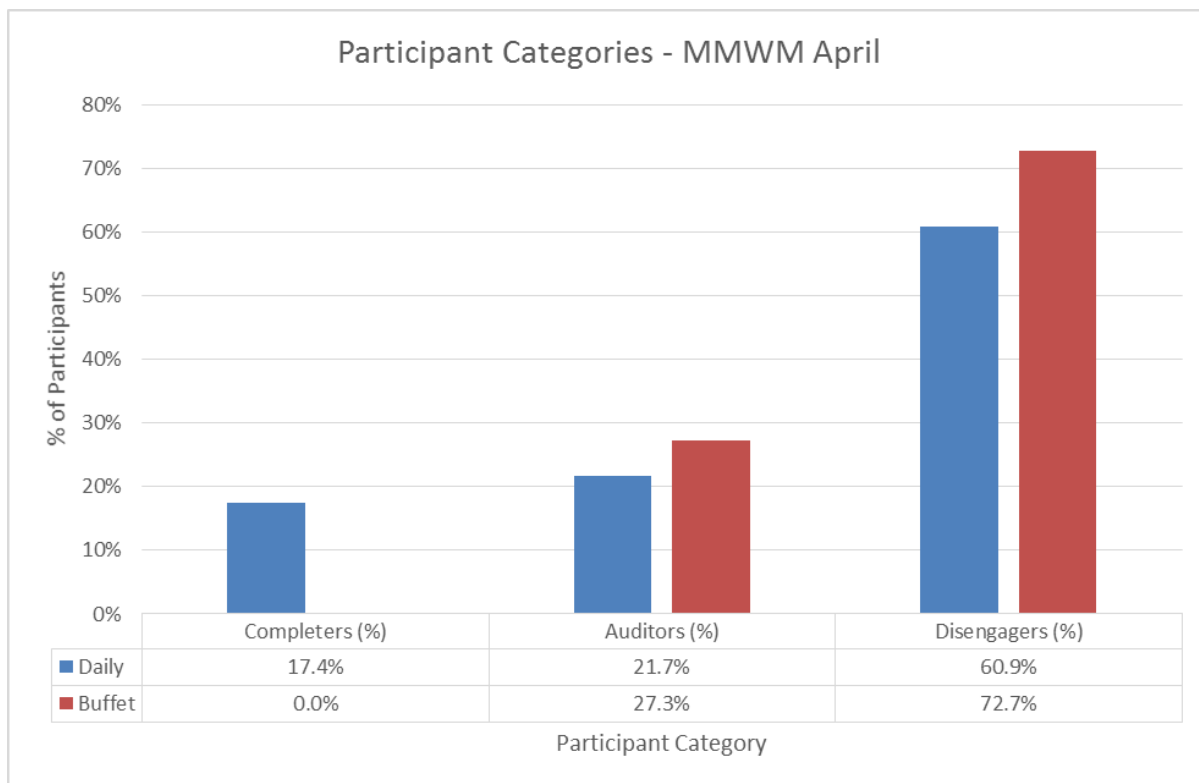


Figure 19: Participant category data for the April instance of MMWM.

The data shown in Figure 19 demonstrates a similar trend to that found previously: the daily format encourages more participants to become Completers, which means that they have participated more regularly over the duration of the course. It also seems to encourage less participants to become disengagers, which is an indication that the course saw more regular participation. This is a notable difference; on the buffet course, not one student was labelled as a completer. However, this may be because the buffet format does not require completing activity every day in order to complete the material. The alternative is that participants entered the course on only one, two or three days, and completed every activity on those days before exiting the course. Looking at overall consumption and completion data, as shown in Figure 20, this does not appear to be the case.

Course	Measure	Day 1	Day 2	Day 3	Day 4	Day 5	Total
Daily Delivery	Auditing	486	530	277	234	218	1745
	/ participant	21.13	23.04	12.04	10.17	9.48	75.87
Daily Delivery	Completing	10	14	3	6	3	36
	/ participant	0.43	0.61	0.13	0.26	0.13	1.57
Buffet Format	Auditing	458	272	198	215	283	1426
	/ participant	20.82	12.36	9.00	9.77	12.86	64.82
Buffet Format	Completing	9	12	6	4	7	38
	/ participant	0.41	0.55	0.27	0.18	0.32	1.73

Figure 20: Completion and consumption data for daily and buffet delivery of MMWM in April 2014.

Overall auditing activity is markedly higher during the daily delivery course, with 76 vs 65 actions per participant in total. This is an unreliable measure when looking at individual days, as shown in Section 4.4.1, but looking at the course as a whole, it does demonstrate an overall trend for higher volumes of involvement in daily delivery which has been shown to relate to engagement, is an indicator of learning. When it comes to completions, the buffet format does have a slight advantage with 1.73 completions per participant vs 1.57 completions per participant under the daily format. This means that some participants may have completed multiple tasks on one day, and questions the results of the participant categories work, shown in Figure 19. This only applies to the difference between auditors and completers, however, and doesn't detract from the advantage the daily delivery format shows in encouraging less participants to become disengagers. The difference between average completions per user is very low (0.16) and so may not be particularly notable.

As with the previous method, it is impossible to draw rigorous conclusions from this data alone, but it will provide a useful ally when used alongside the qualitative data to come in the following chapter.

6.5 Discussion

The June experiment did not yield results which allowed a full statistical analysis to be carried out. This means that the daily delivery format and the buffet format cannot be compared solely using statistics. That result does not render the data within this chapter useless, however, as this research is being carried out using mixed methods. The April results, standing alone, provide a metric which can be brought forward to the following chapter, and take part in a mixed methods analysis.

The April course data will be used to inform the qualitative analysis within the Teaching Format Theory stage, adding depth and an element of explanation. They can also be used as part of a methodological triangulation, using quantitative data and qualitative data together to confirm the results shown. This analysis will now replace the quantitative comparison which was intended between the April and June datasets.

The April data does display a trend which supports the hypothesis that daily delivery may encourage more regular engagement in online learning, and of a higher volume. If this trend can be confirmed within the qualitative data, then that will help this research to triangulate robust conclusions.

6.6 Conclusion

This chapter represents the Teaching Format Experiment stage of research. It utilised qualitative data from the Teaching Format Snapshot to inform the experiment, and drew quantitative data from the experiment itself to produce results. This combination of Qualitative and Quantitative data enabled the mixed methods sequential exploratory strategy approach of stage 2, outlined in Chapter 3.

It was discovered that the data suggested the daily delivery format held an advantage over the buffet model in terms of encouraging involvement, both in regularity and volume, answering research questions 2.1 and 2.2 in the positive. This was borne out over both methods of measurement; participant numbers and participant categories. This conclusion could not be confirmed solely through statistics due to a lack of participation within the June instance of the MMWM course, but with the support of the developing theory, drawn from Chapter 5, it provides evidence towards that conclusion.

In the following chapter, qualitative data will be drawn from the outcomes of this experiment and combined with the quantitative results discussed here. This will provide a methodological triangulation which offers a robust basis for eventual conclusions. It also forms the Teaching Format Theory stage of this work, a second stage of sequential explanatory strategy, and moves towards a more refined theory for BSL.

7. Teaching Format Theory

7.1 Introduction

The intention of the experiment related in the previous chapter was to determine the answer to two research questions, stated in Section 6.1, which revolve around the pattern and volume of involvement within BSL courses. This has been shown to equate to engagement within the BSL context (Section 2.7). In Section 6.4 quantitative data was explored which highlights actual trends in usage amongst the cohort of participants. This provided a view of how the daily delivery format affected performance when compared with the buffet format, and showed the difference in involvement between daily delivery and buffet delivery.

This research takes a mixed methods approach whereby quantitative and qualitative data are combined to increase the reliability of any conclusions drawn. This project was conducted in a real time teaching environment, taking an Action Research approach and, as a result, sample sizes may not be as large as is ideal for robust quantitative analysis. A large number of variables are also present within the samples in the form of varying participant demographics. To this end, qualitative data was always planned as part of a triangulation which helps to ensure that the experiment results from Chapter 6 combined with theory development in this chapter to move towards reliable conclusions. Due to the results which emerged from the June dataset, this triangulation is now even more important. The qualitative data will be used to confirm or deny the trends shown within the Chapter 6 data. If qualitative evidence can be shown to confirm the trend, then robust conclusions can be drawn.

In this chapter, qualitative data is sourced from the courses run during the Teaching Format Experiment. This data is analysed and used, in conjunction with the

experiment's quantitative data, to refine the theory of BSL which was begun in Chapter 5. The outcome of this chapter will be a more refined theory of BSL which can then be taken forward into a theoretical model.

7.2 Method

Following the completion of both daily delivery and buffet courses on the 11th of April, 2014, a survey was sent out to each participant. This survey was administered on Monday the 21st of April and a reminder was sent the following week. For the control group (daily delivery), 14 responses were received from 25 participants, giving a response rate of 56%. For the treatment group (buffet delivery), 10 responses were received from 22 users, giving a response rate of 45%.

The survey processing method in this section followed the same procedure as that described in Section 5.3. Surveys were loaded into NVivo as datasets and coded in a similar manner to that described in Section 5.3.3. The main difference, at this stage, is that thematic analysis had already been carried out in the previous project stage. This means that a set of themes and associated codes had been established, and so this coding activity was intended to further inform and develop those themes.

During the coding process, the full thematic analysis cycle was followed as described in Section 5.3.3, as new codes and themes may have emerged from the new survey data. The main difference is that existing codes were used if relevant, new codes were generated if not, and themes were further refined during each cycle of the thematic analysis process.

7.3 Results

In attempting to answer research questions 2.1 and 2.2 (Section 6.1) this stage of the project is mostly concerned with themes and references which relate to the relative strengths and weaknesses of the daily and buffet delivery formats. As will be discussed, a number of direct references to both were found, as well as many references which allude to the effects of each format. These mostly appear within the *Course Format* theme.

Another theme which was found to be very relevant was that of *Flexibility*. One motivation for this experiment was the conflict between the daily delivery format and optimum flexibility. Sub-themes and references will be discussed which address this conflict and hope to provide an answer as to which format provides the greatest advantage.

In this section, both the *Course Format* and the *Flexibility* theme will be tied into discussion around each format individually. Other themes will also be discussed as they relate to the research questions.

7.3.1 The Buffet Format

Firstly, material which refers to the Buffet Format will be explored. This will include an analysis of all survey references which are considered to apply to this format, and references will be quoted when they add detail to the argument.

Increasing Flexibility Allows Sampling

To begin, one participant reference in particular sums up the concept behind the buffet model approach:

“all materials are freely accessible, so the learner can approach it as required.” Reference 1.0

A second reference adds personal detail:

“all materials being made available so I could dip into the bits I was most interested in.” Reference 1.1

The former reference confirms that the buffet model’s prime strength is adding further flexibility to learning. The learner can consume the material and take part in tasks in exactly the order, the time and the pace that suits them.

The latter reference above adds relevance particularly to WBL where learning is much more about personal development than achieving a particular course outcome or assessment. The buffet approach allows the participant to pick and choose the areas of the course that are the most “interesting” to them, or the most relevant to their own particular working context. This conforms with the requirements of effective adult learning where all tasks must be truly relevant to the participant’s work (Knowles, 2011), and to just in time learning where material must not only be relevant, but timely (Simkins & Maier, 2009). The buffet approach helps to achieve both by allowing the participant to choose the tasks that are most relevant to them, and then to complete that task at a point during the week which is most timely depending on their work.

This approach is very similar to Sampling activity as defined by Kizilcec, Piech and Schneider (2013) where users take part in only some sections of the entire MOOC. Their Samplers category was disregarded within the context of this project as it was felt that it was not relevant to the very short course duration common to BSL. The

references to buffet style consumption, however, allied with quotes relating to participants who “pick and choose” what sections they take part in, suggests that sampling behaviour may be just as relevant in a short course context.

Learner Prior Experience

One new theme which arose within this feedback is the concept of learner prior experience in relation to Bite Sized Learning. The following quotes show the approach taken by those who are already experienced in the subject domain:

“As I'm an experienced user of Moodle just looking for tips and tricks, I spent the start of the week dipping in and out of the content and skipping ahead. I then went back and looked at things I already knew about to see if I was missing anything.” Reference 1.2

“I quickly scanned all the tasks and figured out which ones would be of most benefit. I'm already fairly experienced with Moodle and use multimedia regularly on my pages.” Reference 1.3

This provides evidence that experienced users, those already knowledge in a subject domain, are more likely to utilise the affordances of the buffet method of delivery. They are likely to have “scanned all the tasks” and chosen ones that are most relevant for them right at that particular moment. They are also likely to be “dipping in and out” just to spot tips and tricks that they might not already know. This evidence suggests that the delivery format which should be used within a BSL course - daily or buffet - is heavily context based, and that the choice should be made individually by each educator.

Flexibility and Barriers to Learning

In order to provide final evidence towards the benefits of increasing flexibility for these users, the following reference is presented:

“If the entry point is not fixed at week one / day one users could enter at any point and get something valuable or positive. I feel that this course could allow for this to some extent.” Reference 1.4

This reference lends strength to the view that increasing flexibility is very often a desired outcome for learners. The quote alludes to the fact that learners may not be able to take part on day 1, or may not wish to start with the lesson provided on day 1. It also alludes to the idea that learners may not always have the time to take part in the entire course. The daily schedule creates barriers, even if only perceived, to participating in a more ad-hoc fashion. Participants can feel as if they need to take part in the entire course, rather than being able to pick and choose which elements are useful to them. This is highlighted, also, by the following quote, and its reference to the type of people who may need to take part outside of the standard daily format:

“For people who work part-time it might be helpful to add the entire week’s tasks at the beginning so they can complete early for the days they don't work.”

Reference 1.5

Work based learners are likely to have hugely varying schedules. Many do not work five days per week, and therefore course creators must be very careful of any perceived barriers which arise due to the daily schedule.

7.3.2 The Daily Delivery Format

References to the daily delivery format were numerous. The Daily Tasks sub-theme in particular garnered 11 references, both positive and negative.

Task Length Estimate

Firstly, in contrast to the ITC course discussed in Chapter 5, MMWM received far less references to over-long tasks, or going over the 30 minute estimate. In fact, a new sub-theme emerged during coding which was named Manageable Workload. This term or something similar was used on 8 separate occasions, and is illustrated by this quote:

“the amount of time it required every day was realistic and obtainable.”

Reference 2.0

The frequency of these references suggest that the content and task lengths were much more accurately estimated within MMWM than they were within ITC. This gives confidence to the fact that this data provides an accurate comparison between the daily and buffet formats.

Momentum and Priority

In Section 5.4.6.6 it was proposed that one of the advantages of the daily delivery format is the momentum it builds in participation, the easy access it provides, and the priority it can instil to keep participating and not to push aside or postpone learning. These assumptions were borne out within feedback on the MMWM course, confirming many ideas which were under debate within the ITC feedback due to the underestimated task lengths.

To start the exploration, this quote seems to sum up many of the suggested advantages of the daily format:

“Having daily task helped discipline me to actually do the work, rather than giving us all of the work at once.” Reference 2.1

This reference mentions a key word, discipline, that was absent from the Chapter 5 investigation. This sums up the concept of “plugging away” at the material, discussed in Section 5.4.1.1, and illustrated by the following quote:

“...short daily tasks over a week or so definitely motivate me to plug away at it and not have a big mental barrier about participating.” Reference 2.2

Reference 2.1 also suggests a raising of priority. Both this and the concept of discipline help to answer this work’s second research question. Discipline to take part should naturally lead to more regular involvement. Furthermore, more regular involvement should naturally lead to a greater volume of involvement and more effective engagement with the learning material.

This reference adds more detail:

“I enjoy only being able to access one task per day. It keeps me focused and means I set aside 30 mins per day to do a task whereas being able to access the full course at any time I think its ok to fall behind because i can pick it up again the next day (then forget!).” Reference 2.3

Focus and discipline are very similar concepts in the context of learning. This therefore strengthens the argument that a daily structure encourages learner discipline, thus raising regular involvement. It also refers to a disadvantage of the buffet format, namely an even lower priority of learning because of the lack of particular structure or deadlines. This confirms the proposed disadvantage of the

buffet model, raised in Section 5.4.6.2 in which learners often leave participation until the last minute, and then find it is impossible to catch up.

A number of references highlight this advantage:

“Half an hour a day was a fair expectation and encouraged me to take part.”

Reference 2.4

“I like the way it was staggered - the amount of time it required every day was realistic and obtainable.” Reference 2.5

“...easy to fit 30 minute slot into each day...” Reference 2.6

The “short lesson, every day” format was found to be a large encouragement for learners to take part within this feedback. Nine references specifically referred to this concept, a number of which are related within this section. This lends further strength to the concept that well delivered daily tasks help to instil discipline in learners and momentum in their learning.

Interestingly, one daily delivery participant had taken part in another of the author’s courses which was delivered in buffet format. They, therefore, made a direct comparison between the formats, confirming the above hypotheses:

“I’m currently doing the podcasting course (due to annual leave falling behind that too) but prefer the access to one lesson a day as it helps to keep me focused.”

Reference 2.7

Learner Prior Knowledge and Daily Delivery

Within the previous section, 7.3.1, the concept of learner prior knowledge was raised, and whether this has an effect on the most effective method of BSL delivery. References 2.1 and 2.2 seem to offer further evidence towards this, suggesting that the learners, in both cases, intended to complete the full range of material within the course. This suggests beginner learners, those new to the subject area. They intend to consume the entirety of the course, and appreciate the priority and momentum that daily delivery offers in achieving that.

This is reinforced by the following reference:

“I found the opportunity to spend time working around the site to be very helpful, whereas when I attend training at my university I usual feel like I have got lost within the first 15 minutes and then it is downhill.” Reference 2.8

This was submitted by a daily delivery participant. The concept of note here is that of ‘getting lost’ within less flexible learning interventions. This suggests a learner, new to the area, who is prone to become “lost” when forced to keep to a tutor’s strict learning timescales. Therefore, they benefit from the directed learning guidance that is offered by daily delivery, the flexible pacing that it allows, and the opportunity to revisit previous material when required. The latter two benefit are present, also, within buffet delivery, but it could be argued that it is much easier to become “lost” within a learning experience if everything is offered up at once, increasing choice and possible confusion, and less guidance is offered in how to complete the material. This is further evidenced by reference 3.3 in the following Section.

Accurate and Short Task Lengths

In terms of disadvantages, the most prevalent for Daily Delivery, as discussed in Section 5.4.6.2, is the reduction in flexibility. This led to conflict with normal workload and a tendency towards falling behind, which can lead to disengagement. This was mentioned in a small number of references - “if you miss a day you are behind very quickly” - but appeared a great deal fewer times per participant than within the ITC course feedback. This suggests that the falling behind and catching up sub-themes were particularly noticeable within ITC due to the underestimated task length, and are not as large an issue if tasks are properly managed. Reference 2.4 highlights this in part, suggesting that “half an hour a day” was a fair length of time to expect in one day.

This evidence suggests that one of the main disadvantages of the daily delivery format, a reduction in flexibility, can be mitigated with careful planning and attention towards ensuring tasks are short and accessible. This is something which is mentioned often within the Short Tasks sub-theme. For example:

The learner liked that tasks “Only requires a short amount of time every day.”

Reference 2.9

The learner liked “The flexibility and knowledge that none of the daily tasks should take too long.” Reference 2.10

“Keep on with the short daily tasks.” Reference 2.11

“...Simple, achievable daily goals...” Reference 2.12

Many of these quotes reference explicitly the fact that the short timescale is a major advantage to them. These quotes ally with others above that explicitly link short tasks with daily delivery, such as References 2.5 and 2.6, and create a strong

argument that daily delivery offers advantages that the buffet model of delivery does not.

One concern that has arisen during conversations with practitioners is that short, defined tasks could be argued to limit the growth of learners through stunted exploration. As discussed in Section 2.6, one bite would normally be around 30 minutes, sometimes up to 1 hour. The following reference makes it clear that students see the estimate as an expected timescale which can easily be exceeded by choice:

“I liked the half hour per day even though I probably spent longer in the end through wanting to tinker with it.” Reference 2.13

Learners are happy to spend above and beyond the allocated time if they choose to do so, but the expected timescale estimate, perhaps a minimum time, must be accurately estimated in the first place.

7.3.3 Task Length and Accessibility

One theme that began to emerge within Chapter 5, but which wasn't stated overtly by the participants, was that of accessibility. As stated in Section 5.4.6.7, “accessibility with an element of structure” seems to sum up the ideal state of WBL content. Course material must be as accessible as possible, which incorporates increasing flexibility and reducing learning inertia, while still offering enough structure to encourage prioritisation of the work.

In the qualitative research conducted around MMWM, accessibility was not only suggested, it was overtly stated within seven individual references. For example:

“It's easily accessible, dip in and out type approach which allows me to work at my own pace and around time constraints.” Reference 3.0

“Very accessible.” Reference 3.1

“Easy to access, can fit the tasks into my day and can manage my own workload/time whilst doing the course.” Reference 3.2

The balance of references between daily and buffet delivery was also quite even, with three references for Buffet delivery and four for daily delivery. This suggests that one format is not necessarily seen by the participants as more accessible than the other.

To explain the overt references within this section, as opposed to their absence in the previous section, perhaps accessibility, to the user, is mostly centred on the barrier to entry or the inertia around taking part in learning. The reasoning behind this stems from the overly long tasks present in ITC. Accessibility was not stated openly within the ITC participant feedback, but was prevalent within MMWM. The main difference between the courses, particularly when discussing the daily delivery version of MMWM, is that task length was much shorter on MMWM. Therefore, it seems reasonable to state that short, low barrier tasks may be the main component of accessible learning to participants.

Furthermore, it may be that the daily delivery structure adds to the feeling of accessibility through direction and ease of use. If the aim is to reduce barriers as much as possible, then participants should be guided to their next element of learning with very little effort on their part. The phrase “easy to access” was stated

three times by participants in the daily format. This attitude strongly suggests a feeling, in the learner, that there are no barriers in the way of learning.

Conversely, the buffet model requires an element of self-direction, something which was confirmed within this reference from a June instance on MMWM:

“Works well for self motivated students but many need to be directed.”

Reference 3.3

This itself creates a small barrier to directly accessing learning; a decision must be made before taking part. The daily delivery structure, however, makes this decision FOR the learner. At the expense of a little flexibility, the learning materials are made more accessible. This is another balance between daily and buffet delivery which is suggested by this research, and ties closely with the concept of learner prior knowledge. It is felt that this evidence further suggests that the choice between daily delivery and buffet delivery depends on learner prior knowledge.

Task Length Estimates & Their Relation to Accessibility

A final point on accessibility relates to the reliability of tasks. This is a concept which emerges from the combination of the categories Task Length, Social Interaction and Falling Behind, along with elements of others. In many cases, when a student stated they were Falling Behind, social interaction was mentioned as a factor. These interactions required more time than the rest of the task, and they are more unreliable in terms of the total time required. Another category commonly found alongside Falling Behind, was that of Task Length, particularly when the task length strayed beyond the time allocated. This and many of the references suggest that the length of the task could well be made longer, but that it should be reliable whatever

length is chosen. Pike's 90/20/8 rule (Pike, 1994) certainly suggests that learning interventions may be effective up to 90 minutes, but there is evidence within this project to show that shorter tasks may be more accessible, and are certainly more desirable to the learner (References 7.9 to 7.12, Section 7.3.2). Both factors suggest that a short task length is therefore advantageous to learner engagement.

Both social interactions, and unreliable task length estimations were a major factor in dissatisfaction and drop-out within ITC. This suggests that a core consideration for increasing accessibility is to make task length reliable so that learners know exactly how much time is required, and so can enter the learning intervention happily and with no doubts as to when they will finish.

7.4 Discussion

The thematic analysis process within this section uncovered a number of concepts which are relevant to the research questions stated in Section 6.1.

Firstly, with regards the buffet model, it was confirmed that flexibility in order of consumption is a desirable course format attribute to some WBLs, and this is something which could be relevant to any course with any form of learners. Similarly, references made it clear that the ability to choose WHAT is consumed is also a desirable course attribute. This means that learners within MMWM may find it advantageous to be able to pick and choose materials which are most relevant to them, rather than following along a prescribed path of learning.

In reality, during the course of a week, participants will more closely be able to map their learning to real-life tasks if they are offered a buffet of materials. For example, if the participant has an afternoon free on Tuesday which is normally allocated to

course development, it would be advantageous for them to be able to access the material within MMWM particularly relevant to that task on that day, rather than having it appear one or two days later.

The attributes of choosing WHAT and WHEN map very closely with the theoretical underpinnings of BSL, Just in Time learning in particular. Just in Time learning advocates learning which is relevant at the time of need. This means the right material at the right time, i.e. choosing WHAT and WHEN as stated above.

In terms of disadvantages, buffet learning does seem to be more easy to de-prioritise and can create barriers to learning in the form of decision making and a requirement for self-direction.

Daily delivery of BSL does also allow an element of just in time learning. Courses are short, and so the learner can take part at a time of the year, or the semester, when the tasks are most relevant to them. But, it does remove some flexibility compared to buffet with regards the schedule of learning.

In exchange, however, daily delivery of BSL seems to bring some clear advantages related to the structure of learning materials. As stated in Section 7.3.2 the structure encourages focus and discipline, and a number of references provided detail around this. The format carries risks, and the prevalence of the falling behind sub theme in Chapter 5 is a prime example of that, but with careful design of tasks, keeping them short in length, these risks can be mitigated.

It was discovered that these short tasks seem to be a major key to the success of the format, creating accessible learning which encourages participation. This is an attribute of BSL in general, not daily or buffet in particular, and so is a further

confirmation of the effectiveness of the format as a whole. However, it is argued that daily delivery may increase accessibility by reducing the mental barrier to entry. Daily delivery requires less self-directed learning, making many decisions for students, and so could make regular participation easier for learners.

A caveat to this arises, however, within the discussion around learner prior knowledge that was first raised in Section 7.3.1. References 1.2 and 1.3 demonstrated that learners who are experienced in their field may benefit from a less directed approach, utilising the advantages of the buffet method more effectively. Conversely, learners who are inexperienced in the subject domain seem to benefit more from direction and the higher accessibility which is discussed in Section 7.3.3.

This author believes that further work needs to be done to determine the ideal balance between structure and flexibility. Accessibility seems to be the key in encouraging more participation in learning, particularly with those inexperienced in the subject. However, two aspects of accessibility, mental barrier to entry and increasing flexibility, seem to be partially in conflict. Further research should be carried out to determine which is most advantageous in a WBL setting.

Within the context of this project, the author believes that the references relating to advantages of the daily format are strong enough to confirm the daily structure offers a greater advantage than maximum choice on average. Many of the references, shown in Section 7.3.2, are very explicit about the focus and the discipline that the daily structure offers, and similar advantages were uncovered in Chapter 5 relating to “plugging away” at the material, building habit and promoting priority. Questions are raised around the differing needs of expert learners, but it is often the case that learners are not as expert as they think. If an educator is very confident in the prior

experience of their learners, then this may suggest that the buffet model holds an advantage in that case. But, if prior experience is in doubt, or the educator feels that all material needs to be covered in any case, then daily delivery would seem to offer many advantages.

Finally, it is believed that the qualitative data presented within this section shows robust evidence towards these conclusions in its own right. But, this is a mixed methods investigation and therefore these conclusions can be triangulated with quantitative data. The data demonstrated within Chapter 6 showed a trend of higher engagement when courses are delivered using the daily format. This correlates with the trends summarised above - greater priority, momentum and thus engagement with learning - and therefore helps to confirm these conclusions.

This conclusion answers research question 2.1 from Section 6.1 directly, showing that the daily delivery of tasks encourages more regular involvement in a BSL course with WBLs in an academic setting. It also suggests that the volume of involvement will be higher in daily delivery thanks to the more regular participation that focus and discipline instils. This latter conclusion, backed up by the trends to this effect shown during quantitative analysis in Section 6.4, seem to show strong evidence of a positive answer to research question 2.2.

7.5 Conclusions

In concluding this chapter, each stage of this research will be tied together in order to move towards a theoretical of Bite Sized Learning (BSL).

This work began with the production of a Teaching Format Snapshot. This was intended to evaluate the current status of the teaching format in question, BSL, and allow for initial theory to be developed.

This snapshot then enabled the creation of an experiment intended to improve the format. This experiment, the Teaching Format experiment detailed in Chapter 6, tested the following hypothesis: When comparing a daily delivery format course with a buffet format course, a difference will be found in the regularity and volume of involvement between the two, and in the motivation that they provide the learner to participate.

It was discovered that, during the Teaching Format Experiment, quantitative measures showed both more regular involvement and a higher level of involvement. This difference was, however, not statistically significant and so cannot be used to draw conclusions alone. They do demonstrate a positive outcome on the aforementioned hypothesis, however: involvement regularity and volume are greater within a daily delivery format. This outcome was noted and brought forward to be used as part of a methodological triangulation in the following chapter.

Within the final stage, Teaching Format Theory, qualitative data was sourced from the Teaching Format Experiment, and a mixed methods picture of engagement emerged which helps to answer the research questions stated in Section 6.1. Firstly, references made clear that the extra flexibility offered by the buffet method is desirable to learners, and that it may be particularly advantageous to learners already experienced in their field. The ability to pick and choose materials which are particularly relevant to the learner, alongside the option to choose when to study,

provides truly flexible learning. This was found to be well suited to WBLs, and very much conforming to the Just in Time learning concept (Simkins & Maier, 2009).

However, it was revealed that the daily format encourages discipline, focus and increased priority. As a consequence, involvement, both in volume and regularity, should increase. It was noted here that this is particularly advantageous to beginner or intermediate learners, not fully conversant with their field.

Bringing the two sets of results together: the conclusions drawn from both Chapters 6 and 7 present evidence towards a positive answer to research questions 2.1 and 2.2. The qualitative data provides strong evidence, on its own, to this effect, but triangulation with the quantitative data from Chapter 6 helps to make this conclusion more rigorous.

According to qualitative measures, daily delivery does encourage more regular participation in learning than buffet format, and there are indications of this in the learning analytics also.

According to qualitative measures, daily delivery does encourage a greater volume of participation in learning than buffet format, and, again, the analytics suggest this also.

It is acknowledged, however, that in the context of an expert learner, regularity and volume of participation may be less important than the flexibility to choose their own order and pace of learning.

It was established within Section 2.7 that increased involvement has been shown to improve the chance that a learner will achieve their academic goals (Astin, 1984, p.301). Involvement has also been linked with satisfaction and persistence in

learners (Trowler, 2010). Finally, it has been shown that involvement is linked to engagement, when the involvement is with purposeful educational activity (Kuh et al., 2007, p44; Astin, 1984, p301; Chickering & Gamson, 1987). This suggests that by encouraging an increase in involvement over the buffet method, the daily delivery format creates students that are more satisfied with their learning, more engaged with the materials, and who will persist with it and other learning interventions for longer. This increases the likelihood of achieving academic aims.

8. A Model for Bite Sized Learning

8.1 Introduction

In the previous chapter, two methods for the delivery of bite sized learning (BSL) were explored qualitatively: daily delivery and buffet delivery. Combined with the quantitative study outlined in Chapter 6, this facilitated an exploration of the strengths and weaknesses of each delivery method in a WBL context within academia. Finally, this led to a refinement of the themes and emerging theory developed in Chapter 5 which define how WBLs might interact with and benefit from BSL.

In this chapter these themes are linked to their theoretical concepts (Charmaz, 2006) and will be used to create a theoretical model of Bite Sized Learning. This model will allow educators to apply the components of BSL in a way which best suits their students, and the learning objectives therein.

8.2 The 3-Path Bite Sized Learning Model

8.2.1 Introducing the Model

In this section a proposed model of BSL will be constructed from the themes and concepts that emerged during the three stage process of this research. This is an initial attempt to broadly define BSL as a teaching method, and to explain the concepts that underlie and interrelate within the practice. Figure 21 below displays a visual representation of the BSL model based on the research conducted within this project, and underpinned by preceding literature.

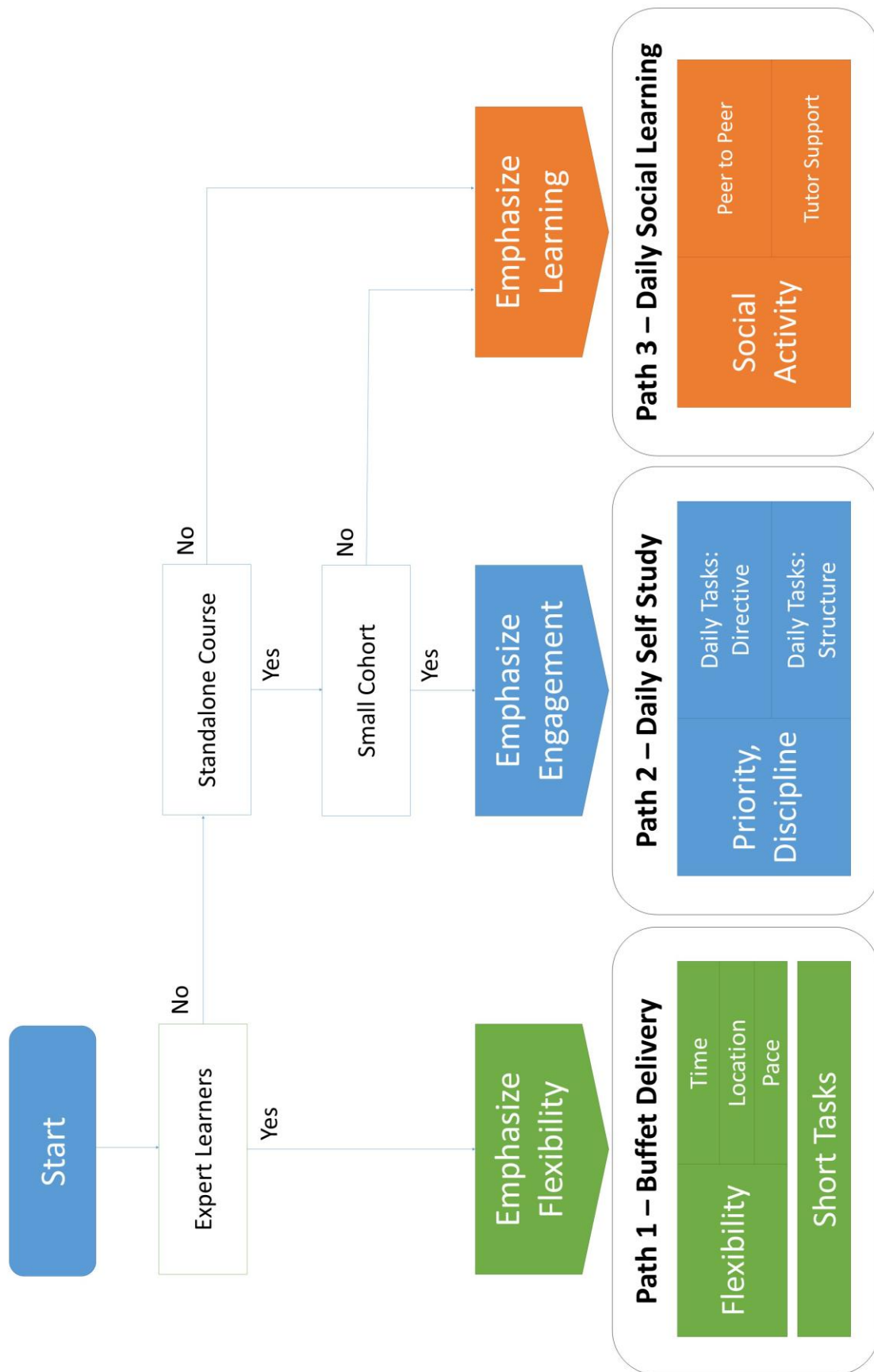


Figure 21: A 3-Path Model of Bite Size Learning.

As explored through the three stages of this research, learning accessibility is one of the core concepts that underpins the BSL method, and describes a large part of the needs of work based learners (WBLs). Accessibility comprises a number of sub-concepts which correspond to themes which emerged during Chapters 5, 6 and 7:

- Flexibility in...
 - time
 - place
 - pace
 - consumption
- participation inertia
- task volume consistency

Accessibility has been shown in Section 7.3.3 to benefit WBLs and to encourage greater retention rates in online learning.

The second overriding concept that underpins the BSL method is that of structure. Structure is represented by the drip-fed method of course delivery, in this case coming in the form of daily delivery. The daily delivery format has been shown, in Section 7.3.2, to encourage the habit of learning, enabling regular involvement, and to increase the priority of participation. This leads to a greater regularity of participation, and subsequently to a higher engagement.

A final concept which underpins the BSL is that of social interactions. In Section 5.4.3 social interactions were found to be desirable and effective in some contexts and with some learners. They have also been shown to encourage more effective learning by the background literature, as shown in Section 2.2.2. This research did

not aim to evidence the learning which is encouraged by social interactions, relying, instead, on the findings of the background literature.

These three core concepts interact within the bounds of BSL to produce learning and engagement to varying degrees, and it has been discussed how some of the elements are in conflict. For example, increasing social interactions reduces accessibility. With this in mind, and with the aim of allowing practitioners to implement the BSL model very easily, it is necessary to show how these concepts can be combined, and how they interact when this is done.

The model shown in Figure 21 is intended to demonstrate these interactions, and allow implementation through the medium of a flow-chart. The model outlines three 'paths' for utilising BSL, based on this research, which can be incorporated in any learning intervention. The paths are shown in sequence, from path 1 to path 3. As the paths increase in number, they incorporate everything within the path that came before, therefore they are incremental: path 2 building on path 1, and so on.

Therefore, as one moves up the sequence, each path becomes slightly more complex, but can achieve different aims.

Each path has unique strengths and is suited to a particular learning context. The following sections will outline these strengths and contexts in order to allow the use of this model in a wider work based learning context. The model is designed to be used, however, even without this explanation. Any educator can simply follow the flow-chart, answering questions based on their context, and find the path which suits them most effectively.

8.2.2 Path 1: Buffet Delivery

The first path in the model emphasises flexibility. This is based on the findings within this project that flexibility is one of the core requirements of WBLs. It is also underpinned by preceding literature on work based learning and the philosophy behind just-in-time learning, all of which state the importance of accessibility in facilitating learning in a WBL context.

This path represents the use of a buffet format of BSL. It allows completely free access to materials, denoting maximum flexibility in each of the four dimensions of time, place, pace and consumption. It also implements the short tasks format which helps to increase accessibility by reducing participation inertia. Task volume consistency is key, however, in order to retain this increased accessibility. The perception of accessibility is built within learners through experience: trust in this concept grows as it is shown that tasks can be completed within the time stated.

Accessibility could be increased by adding direction and structure within the learning materials, such as a daily delivery format. This is because, in a buffet model, students must choose their own path and make decisions for themselves. The sequence of learning is not made as clear to the learner as it would be in daily delivery. However, daily delivery brings lowered accessibility through structure, therefore this path emphasises flexibility.

Context of Use

This path is most useful in contexts where a very high level of flexibility is desired and learners are of an experience level where they are capable of self-direction and self-discipline. This experience should include both the subject domain and online study skills.

Examples of this context could include expert level tuition, where basic material has already been covered in an online context. In this case learners will already have grounding in the area and are advancing their skills further through online means. Prior knowledge may be particularly varied in this context, and so the flexibility over what to consume and in what order could be particularly pertinent to students.

8.2.3 Path 2: Daily Self Study

The second path in the model emphasises involvement. This builds upon the components of path one, but adds daily tasks to the mix.

As shown in Section 7.3.2, daily tasks can bring focus and discipline to learning. This project has shown links between daily tasks and increased regularity and volume of involvement thanks to this discipline. The mixed methods data explored within Chapter 7, added to that found earlier within Chapter 5, strongly suggests that daily tasks increase the priority of regular participation for learners. This was triangulated with quantitative data, as shown in Section 7.4, to add rigour to the results.

Daily tasks increase accessibility through direction, guiding learners through the material and thus reducing participation inertia. But, daily tasks reduce accessibility due to the structure which is imposed on participation patterns, e.g. the requirement to participate each day, and to consume learning materials in a particular order. It seems, however, that while this structure reduces accessibility, the focus and discipline that it instils subsequently improves involvement.

As has been discussed, increased involvement with purposeful educational activities translates to increased engagement, and can indicate increased learning. Therefore, learning may also increase within this path over path 1. Chickering and Gamson (1987) specifically mention time on task as an effective educational practice, and

Kuh et al (2007) link engagement to time and effort put in by the learner. This justifies the aim of increasing involvement within a course, and greater academic success has been shown to follow as a result.

Context of Use

Daily Self Study may be useful in contexts where beginner to intermediate material is being covered, and so it is likely that all learners are at a very similar level. The progression through material will be more obvious in this context, and therefore the structure is useful and less restrictive. Learners may benefit from clear direction at this stage, and optimum engagement is desired in order to get a thorough grounding in the subject matter.

This path may be well suited to courses which are one-off, not necessarily related to any other BSL interventions. In this case there is less benefit in starting to develop a learning community, something which will be discussed next, in path 3: Daily Social Learning.

This format would also be suited to courses which are delivered often, or are constantly running in a just-in-time learning style. In this case, cohort sizes are likely to be small and not disposed towards fostering active community discussions. If high involvement with the material is desired, but the commitment to social interactions is unlikely, then this format will work well.

8.2.4 Path 3: Daily Social Learning

The third path in the model emphasises depth of learning. This builds upon the previous paths by adding a social component to the mix.

As was discussed in Section 2.2.2, communities of practice have been shown to help learners proceed from novice to expert in an effective manner. This was a desired trait for BSL in order to instil a higher order of learning through social interaction and discussion, particularly peer to peer. It was discovered in Chapter 5, however, that social learning creates a high level of participation inertia through learner confidence issues and shy behaviour. It also reduces task volume consistency because it is very hard to estimate how much time a social interaction will take, or how much social material will be created and therefore have to be consumed by learners.

Furthermore, when including tutor support in this category, further problems arise. While tutor support can have a large effect on learning, it becomes a problem when it is relied upon by learners and response times are less than extremely quick. Even relatively rapid response times can be too slow for many learners and can discourage participation or self-directed problem solving.

It is thought that the Daily Social Learning path may produce the most effective learning overall. The main backing for this argument comes from the background literature, as discussed within Chapter 2. In addition, some references outlined within Chapter 5, and Section 5.4.3 in particular, lend support to this view within the BSL context. Many of these references, however, also highlight the problems that social learning can introduce and demonstrate that it must be used very carefully and perhaps only in particular learning contexts.

While learning is emphasised within this path, involvement and engagement may be reduced. This reflects the marked decrease in accessibility which accompanies a requirement for social interaction. As has been discussed in Chapter 5, many learners can be put off by social interactions, or simply find them a barrier to

involvement. Therefore, this path reflects higher level learning, but a decrease in involvement relative to path 2.

Context of Use

The context of use for this path is similar to Daily Self Study; it suits beginner to intermediate level learning, where direction is beneficial, volume of involvement is important and the freedom to skip materials is less beneficial. But the context differs through external course factors, such as the place of this course within a wider programme of learning, and the frequency of delivery. While Daily Self Study is suited to one-off courses, or those with smaller cohorts, Daily Social Learning is suited more to courses which are part of a larger programme of learning, either a small section of a more traditional course, or part of a sequence of BSL interventions. This means that the generation of a learning community is more practical and more valuable, as it is much longer lasting, providing benefit beyond a single BSL episode.

This path is also suited to BSL courses which run less often, and so may generate larger cohorts, or simply for courses which are guaranteed a large cohort of 20 or more participants. This means that any single course is much more likely to generate the critical mass of discussion which avoids the issues around lack of peer to peer interaction which were discussed in Section 5.4.3.

8.2.5 Choosing Between Daily Self Study and Daily Social Learning

It may seem possible that a tutor could design a Daily Tasks course which offers both self-study and social learning. Social tasks could be made optional so that learners may choose whether they want to participate or not. This would reduce participation inertia, because learners would not feel forced to take part if they felt shy or unsociable. It would also reduce the problem with task length consistency

because time spent on social could be discounted from the required material task length.

Through the experience of delivering BSL learning, however, the author feels that when discussion tasks are made optional, they are most likely to fail. As was found in Chapter 5, while users find community discussion valuable, and learning communities have been found to improve learning, the *business* that was common throughout is likely to lead to very strategic learning. This means that the majority of learners will do only that which is completely necessary to complete a course and optional tasks will be dropped. Empty discussion boards can produce a negative impression of the course and discourage learners, as shown by a selection of references to that effect in Section 5.4.3. As a consequence, anything that can lead to this situation should be avoided. Therefore, it would be recommended for any educator to choose one type of daily task format that suits their context and do that type well, rather than spanning the formats.

8.2.6 A Modular Definition of BSL

An initial definition of BSL was stated in Section 1.2. This definition outlined the full version of BSL, incorporating all 3 paths of the model shared here. It is clear now, however, that the definition is modular, and can be built up as demonstrated in the model shown in Figure 21.

Here is presented a modular definition of BSL:

Path 1 BSL is:

- fully online, and accessible anywhere with an internet connection.
- delivered in 'bite sized' chunks of learning, commonly around 30 minutes.

- facilitated through active tasks which are carried out within participants' regular work.
- a format which runs over a short overall time, such as 1 or 2 weeks.

Path 2 BSL is *also*:

1. made from tasks which are delivered regularly and often; every 1 or 2 days.

Path 3 BSL is *also*:

2. active and social, requiring external action, feedback and interaction from the participants throughout.

8.2.7 Implementation of the Model

It is worth noting that this model has already been put to work by at least two institutions, due to the author's early dissemination of this work.

The Scottish Institute of Enterprise (SIE) are currently developing Bite Sized Learning modules based on this research, aimed at entrepreneurial students. The long term plan is to develop a series of seven courses which intend to give higher education students the skills to plan and run their own business. The first course of this series is currently being completed, and is titled "Developing Business Ideas." The SIE are planning to implement path 2 of the model, creating five daily tasks for this first module, each released on completion of the previous task.

This approach was chosen based on the flow-chart shown in Figure 21. The SIE's learners are mostly very new to the subject of business, and are therefore early stage learners. At this stage the cohort sizes are likely to be very low, and the course is stand-alone. This combination of factors leads us through the flow-chart to path 2.

In the future, as mentioned, the SIE plans to have seven courses within this larger offering, and therefore the flow-chart direction is likely to change. By that point, cohorts will be larger, and the sequence of learning will be longer. Therefore, it may transpire that it is worthwhile adding a social aspect to the offering, changing the approach to path 3 BSL.

The buy-in that the SIE usage evidences towards the BSL approach, and the adherence to the BSL model, is seen as valuable positive feedback on the outcomes of this work. It goes some way to show that the model is useful and generalizable in a real-world context outside of the author's research.

8.3 Conclusion

This Chapter proposed a model of bite sized learning for use by work based learning educators in creating their own learning resources. This model was developed upon the themes, concepts and theory which emerged from the three stage process outlined throughout Chapters 5, 6 and 7.

The model proposes three paths of bite sized learning, each of which build upon the last to increase the complexity of the learning format. Each path is suited to a particular learning context and their suitability depends greatly on the aims of the course in question. The model proposed in Figure 21, and the explanations provided within Section 8.2, are intended as a tool to allow any educator to choose a bite sized learning format which best suits their context.

In the next chapter this thesis will be concluded, the overall outcomes being discussed and summarised. Suggestions for further work will also be covered in order to allow the continuation of this research.

9. Conclusion & Future Work

9.1 Introduction

This research began with the intention of evaluating the effectiveness of an emerging online teaching method in the context of Work Based Learners in academia. The subsequent aim was to develop this method through experimentation and then propose a model for bite sized learning for more general use in work based teaching and learning.

The main contributions to knowledge presented by this thesis are as follows:

1. The proposal of a methodology 'stack' approach to research which is effective in developing new methods of teaching.
2. The proposal of an effective method for measuring engagement in open online learning within Moodle.
3. The creation of a 3-path model for bite sized learning.

These contributions have been made during an action research process spanning four years. This process has included the planning, delivery, evaluation and development of courses using the bite sized learning delivery method. Bite sized learning is described in Section 1.2 and is defined in the 3-path Model for Bite Sized Learning.

This section will offer final comments on each of the three elements above, and discuss the future work which would benefit their development.

9.2 'Stacking Methods' to Build an Action Research Platform

This project has been described as utilising a three-stage structure, 'stacking' methodologies to produce the most effective results. It was found that this provided a useful structure for designing a well-informed action research project.

As discussed in Section 3.2, action research starts with the planning phase and the formulation of a hypothesis. This does not always take into account the entire current status of the phenomenon to be investigated. The 3 stage 'stack' intends to mitigate this by introducing evaluation, experimentation and theorising steps, all of which work together to create a more informed mixed methods result.

Action research can be criticised for being insular and subjective because the researcher is often analysing their own practice and the results of that work. But, a mixed methods evaluation stage reduces subjectivity and increases rigour by providing a triangulated measure of the status of the phenomenon in question. This creates a robust base-level platform on which to build hypotheses and design future experiments.

The first stage of this project aimed to evaluate a number of learning interventions that had already taken place. No research was formally conducted during these courses, and no hypotheses had been proposed or tested, therefore a straightforward mixed methods study was designed using a sequential explanatory strategy. This strategy was found to be well suited to studying a phenomenon already in existence, in this case a BSL course, and explaining why it produced the results that it did. This process results in an initial theory intended to explain the components of the phenomenon under study, and how they interrelate.

The second stage of this project then aimed to design an experiment which would test a change to the existing learning model. A sequential exploratory strategy was used in this stage, building an experiment based upon the outcomes of stage 1, and then using quantitative data drawn from the experiment to test its effectiveness.

Stage 3 moved back to a sequential explanatory strategy, as qualitative data was drawn from the experiment. This was key in explaining the results of the experiment alongside the quantitative data which was found in stage 2. This combination provides valuable triangulation and moves to refine and finalise the theory which began to emerge in stage 1.

This stack of methods provides a solid foundation for future qualitative research within a similar context. The analysis carried out on these base-level courses has generated a set of constructed codes and refined themes which could inform future analyses. These will provide structure and rigour to these analyses, and enable comparisons to be made which could measure improvement in engagement in future. These constructed codes are provided in Appendix C for use by other researchers.

In summarising the innovation presented here, firstly this model offers a much more advanced starting point for researchers in this context in the future. This model fleshes out the standard view of an action research cycle, adding detail and methods to each stage. Secondly, this model advocates both explanatory and exploratory stages to any educational research project, which reduces both the subjectivity and the insular nature of many action research projects. The explanatory evaluation stage sets the scene in an objective manner, but then allows exploration through a second stage experiment which is tightly linked to the outcomes of the 'snapshot'

stage. Finally, explanatory approaches are then stacked on top of the exploration in order to generate theory. This helps to create something which is replicable by other educators.

Future work in developing this set of constructed codes would be valuable. While the code tree related to this research is provided for reference, coding will vary significantly within different contexts. The code tree generated during this work provides a more advanced starting point for future research, but it is not a complete schematic. For example, within this work, even though the courses under investigation were very similar, new codes emerged during stage 3 when compared to stage 1. It is debatable whether a generally usable set of constructed codes could be generated, but this author would certainly have found a suggested framework for coding useful in the beginning, even though it would have to be adapted for this specific research. This framework could include major themes which can be expected to emerge within any online learning research, thus giving future researchers a stepping stone to creating their own constructed codes.

9.3 Measuring Engagement in Open Online Education

This study used the quantitative outcomes of six instances of one open online course to determine an effective method for measuring engagement in online learning. This work was related in Chapter 4 and showed that participant numbers are more effective than volume of participation or participant categories. The method for carrying out this type of analysis was related in Section 4.3 and could be carried out in the same way by anyone with access to learning analytics via their virtual learning environment.

While this study has concluded that Method 2, participant numbers, provided the most effective analysis, Method 3, participant categories, has many interesting possibilities. Future work could include adding more granularity to the categories. For example, samplers may be a useful category after all, as the final data showed that many participants entered the course on only 3 days, but spread across the week. This could indicate interested learners who prefer to participate less often than every day, but still achieve success and satisfaction with the material. The data sourced from Moodle, if set up correctly, could be used to determine how many daily tasks participants complete on their two or three weekly visits, and could classify them as Completers. Finally, the criteria for each category could be experimented with more fully. By adjusting the completion category to include those that completed only 5 events, or those that complete 3 or more, could have an effect on the final results and the reliability achieved.

It would be advantageous to continue this work with larger sample sizes and more course instances. The work discussed in Chapter 4 showed a comparison of six course instances, but greater reliability could be achieved with the addition of further instances. Reliability may also be increased by more consistent sample sizes across course instances. In instrument experiments, such as that discussed in Chapter 6, this may be even more important. Only with more course experiments comparing more course instances with consistent sample sizes can deeper statistical methods be implemented to test the reliability of conclusions that are drawn numerically. As was shown in this project, mixed methods analysis can overcome this limitation to an extent through a methodological triangulation, but more extensive and thorough quantitative data could lead to quantitative conclusions that can stand on their own, and would benefit even more greatly from pairing with qualitative data in future.

9.4 The 3-Path Model for Bite Sized Learning

This study is a first attempt to understand the factors at play in online work based learning in academia, when a bite sized learning method is employed. The research is rooted in the more general educational research literature, as well as the specific strands of student engagement, virtual learning and MOOCs. The model for bite sized learning which was proposed in Section 8.2 is an initial framework to outline and explain the factors at play when delivering very short, focussed learning interventions in an attempt to encourage professional development in academics. This model can be used to develop future bite sized learning courses, and to implement the approaches that are most suited to the context at hand.

The main area of future work around the model would be in testing the generalisability of its structure. It would be very interesting to test the model in WBL contexts outside of academia. For example, the author currently uses this model to develop online education for business learners, from small business owners looking to develop their skills, to employees of large companies. Further testing of the model in this context is planned.

It may be that the model is also generalizable outside of WBL. The attributes of WBLs are becoming more common in traditional education, for example, as students become more likely to work during study. Furthermore, traditional structures of study are being disrupted as students call for more condensed degree timescales.

Therefore, it may be that the components of BSL are just as relevant to students in further and higher education as they are to WBLs. It would be interesting to see further work in testing the BSL model in much more wide reaching educational contexts.

9.5 Other Future Work

The previous three sections have covered the main outcomes of this thesis, and the related future work. Other areas of interest have emerged during this research, however, and they will be covered here, in brief.

The concept of Priority was one that strongly emerged during this thesis, and which is felt to be well worth pursuing in more depth. It has already been suggested that gamification may be one solution to the problems which were discovered around a lack of priority. Simple implementations of gamification, such as peer progress tracking, may provide a boost in priority. More sophisticated methods, such as team competition or open badges, could also be trialled in an attempt to increase the priority of learning in the mind of participants.

Another area of future work centred on combating the themes of *Falling Behind* and *Catching Up*. It was suggested that sequence breaks or extra credit tasks may aid in this, if they are well signposted and explained. By breaking up the main sequence of tasks, participants who have fallen behind may then catch up by carrying out missed tasks on extra credit days. Or they may be able to re-enter the course at a sequence break; a part of the course that starts a new set of tasks which do not rely on previous activity or material. This author believes that, implemented correctly, these elements could have a very positive effect on retention rates within BSL courses, particularly those that may span two weeks. The concept could equally apply to online learning in general, ensuring that students who are struggling always have a low-barrier re-entry point to their education.

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Appendix A: Post-Course Survey

This appendix includes a copy of the questions which were administered following each instance of ITC and MMWM.

1. Did the Course Achieve The Aims You Had When it Started?

Multiple Choice - Not at all/Somewhat/Mostly/Definitely

2. What did you like most about the course?

Open Answer

3. What do you think could be improved about the course?

Open Answer

4. What are the advantages, to you, of the way this course was delivered?

Open Answer

5. What are the disadvantages, to you, of this method of delivery?

Open Answer

6. How did your participation change throughout the week, and why?

Open Answer

7. How do you think we could keep engagement high throughout the course?

Open Answer

If you're willing to take part in a brief follow-up interview I'd really appreciate it - please leave your name and email below.

Open Answer




Appendix B: Course Examples

Course Introduction – Making Magic with Moodle

Make Magic with Moodle

Welcome to the course!


'Make Magic with Moodle' is a course about 3 things:

 Readability  Usability  Flash!




We're going to learn how to set up a Moodle course that works for your students, supporting their learning as well as possible by following those key principles.

We're going to make a Moodle course that's really easy to use, to work through, to follow.

And we're going to make a Moodle course that looks good, that has a bit of flash, and encourages your students to keep coming back.



By the end, you'll be a ninja master in creating usable, readable, great looking Moodle courses. Let's begin!

 Course Info  Course Forum  What We'll Learn

Day 1 Day 2 Day 3 Day 4 Day 5

This is the course introduction from Making Magic with Moodle.

Unit Introduction – Day 1: Making Magic with Moodle

Day 1

A Little Spring Cleaning

Today we're going to start by tidying things up a little.



One of the downsides of Moodle is that its default layout is a little cluttered, and it doesn't offer much in the way of flexibility when it comes to displaying content on the course.

Today's task is to tidy that up - first by giving the content more room, and second by adding in more useful guidance. We'll be watching a couple of videos to help with this, so why not get started below.

- [Why Spring Clean?](#)
- [1. Block Elimination](#)
- [2. Creating Labels](#)
- [Your Tasks](#)

This is the introduction to Day 1 on Making Magic with Moodle.

Unit 1: Activity 1

Activity 1: Minimise! Remove those blocks



Your default Moodle module will come with a whole host of blocks. Some of them are very useful, and some aren't. You can free up a lot of reading space, though, and make your module far less cluttered, with just a little block maintenance.

Have a look at this video on **Moving and Deleting blocks** for some block-pruning tips.



Is this view too small? View the video fullscreen by hovering your mouse over the image, and then clicking the 'Full Screen' icon on the bottom right. It's a box right next to the YouTube logo.



This is activity one, within Unit 1 of Making Magic with Moodle.

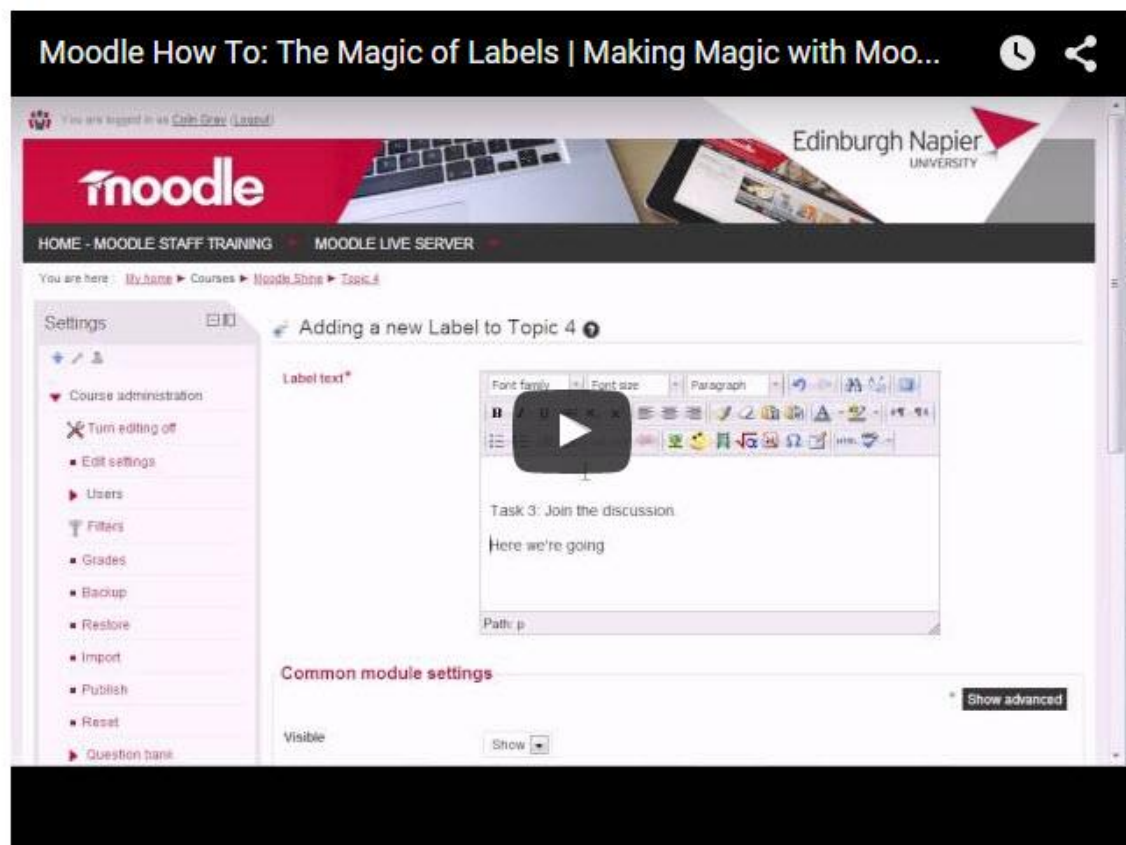
Unit 1: Activity 2

Activity 2: The Magic of Labels



Labels are hugely useful little objects. They let you add a little bit of text, some pictures or some links anywhere on your module page. This allows for so much more explanation, guidance and signposting for your students, rather than offering a pretty baffling list of activity and resource links.

Labels are the key to making a good looking and easy to use module. Check out this video to learn how:



Is this view too small? View the video fullscreen by hovering your mouse over the image, and then clicking the 'Full Screen' icon on the bottom right. It's a box right next to the YouTube logo.

This is activity 2 within unit 1 of Making Magic with Moodle.


Unit 1: Tasks

Tidying up your Moodle Module

◀ ▶

Your Tasks

Your Tasks





As I mentioned earlier, I'd recommend trying to complete these tasks directly in your module - improve something you're working on right now, or start to create something new that you'll be teaching quite soon. I always find that's the best way to engage this material.

- 1. Cut Down Your Blocks.** Go into your module and prune the blocks that are there, keeping only the ones that are totally necessary. If you can, cut them down so that you're only using one column on the left, giving your content much more room on the right.
- 2. Create Helpful Labels.** Go into your module and try creating some new labels - put them in important locations, to guide your students. Let them know what they should be doing in each unit of the course, and signpost the various resources you have within those units. We'll look at adding icons and links to these labels tomorrow.

◀ ▶

These are the tasks for Unit 1 of Making Magic with Moodle.



Example Discussion


 **The Navigation Bar**
by  - Thursday, 10 April 2014, 11:17 AM

Just to say thank you for the Navigation Bar video. If there's just *one thing that I would take away* from this course (and there's more!) it's the use of the anchor to keep it displayed.



Great! Will spread the news!

[Edit](#) | [Delete](#) | [Reply](#)

 **Re: The Navigation Bar**
by  - Thursday, 10 April 2014, 11:40 AM

I agree  - really useful. What I added was to make the first item on the navigation bar a "home" button which links back to the full page rather than just showing one section

[Show parent](#) | [Edit](#) | [Split](#) | [Delete](#) | [Reply](#)



 **Re: The Navigation Bar**
by  - Thursday, 10 April 2014, 5:52 PM

I have wanted to know how to do a navigation bar for long time and finally I know how!

The video was really easy to follow - the only trouble I had was with the colour of the text and background of the boxes. That did fox me as I thought I was following the video. I still don't know how I managed to get white text on a black background in the end. The trouble was that the text was one colour, the area immediately around the text another colour and then the background a third colour - for some reason it did not want to do a single text/background contrast.

A really useful video.

[Show parent](#) | [Edit](#) | [Split](#) | [Delete](#) | [Reply](#)



 **Re: The Navigation Bar**
by  - Thursday, 10 April 2014, 10:22 PM

A really clear video, but sadly I can't get it to work for me :-)

I'm not sure why - it reloads the page, but still shows all the topics. The only way I can link to a section (but still showing all of the others) is to add "#section-3" to the end of the course URL.

I wonder whether it's something in our admin settings that could be stopping it? I can't see any other reason, and I don't think it's just sleep deprivation :-)

[Show parent](#) | [Edit](#) | [Split](#) | [Delete](#) | [Reply](#)

 **Re: The Navigation Bar**
by  - Friday, 11 April 2014, 8:04 AM

This is an example of a discussion thread from Making Magic with Moodle.

Appendix C: Output of Constructed Codes from NVivo

Output of Constructed Codes from NVivo

Name	Hierarchical Name
- Course Format	Nodes\\- Course Format
Buffet Model	Nodes\\- Course Format\\Buffet Model
Challenging Material (in a good way)	Nodes\\- Course Format\\Challenging Material (in a good way)
--Duration of Learning	Nodes\\- Course Format\\--Duration of Learning
Course too short	Nodes\\- Course Format\\--Duration of Learning\\Course too short
Daily Tasks	Nodes\\- Course Format\\--Duration of Learning\\Daily Tasks
Length of Full Course	Nodes\\- Course Format\\--Duration of Learning\\Length of Full Course
Exercises to Practice Skills	Nodes\\- Course Format\\Exercises to Practice Skills
General Course Format	Nodes\\- Course Format\\General Course Format
--Lack of Face to Face	Nodes\\- Course Format\\--Lack of Face to Face
Slow Support Responses	Nodes\\- Course Format\\--Lack of Face to Face\\Slow Support Responses
Manageable Workload	Nodes\\- Course Format\\Manageable Workload
Short Material	Nodes\\- Course Format\\Short Material
--Task Length	Nodes\\- Course Format\\--Task Length
Length of daily materials	Nodes\\- Course Format\\--Task Length\\Length of daily materials
Short Tasks	Nodes\\- Course Format\\--Task Length\\Short Tasks
Tasks too Short	Nodes\\- Course Format\\--Task Length\\Tasks too Short
Workload	Nodes\\- Course Format\\Workload
- Flexibility	Nodes\\- Flexibility
-- Time Flexibility	Nodes\\- Flexibility\\-- Time Flexibility
Fit Around Work	Nodes\\- Flexibility\\-- Time Flexibility\\Fit Around Work
Flexible Order of Consumption	Nodes\\- Flexibility\\Flexible Order of Consumption
Flexibility - Disadvantages	Nodes\\- Flexibility\\Flexibility - Disadvantages
General Mentions of Flexibility	Nodes\\- Flexibility\\General Mentions of Flexibility
Location flexibility	Nodes\\- Flexibility\\Location flexibility
Pace Flexibility	Nodes\\- Flexibility\\Pace Flexibility
- Measures of Success	Nodes\\- Measures of Success
Accessible	Nodes\\- Measures of Success\\Accessible
Change of behaviour	Nodes\\- Measures of Success\\Change of behaviour
Effectiveness	Nodes\\- Measures of Success\\Effectiveness

Name	Hierarchical Name
Enjoyment	Nodes\\- Measures of Success\Enjoyment
Evangelism	Nodes\\- Measures of Success\Evangelism
Personal Attachment	Nodes\\- Measures of Success\Personal Attachment
Point of Confidence	Nodes\\- Measures of Success\Point of Confidence
Useful	Nodes\\- Measures of Success\Useful
- Participation Patterns	Nodes\\- Participation Patterns
-- Busyness	Nodes\\- Participation Patterns\-- Busyness
Participation Prompts	Nodes\\- Participation Patterns\-- Busyness\Participation Prompts
-- Form of Participation	Nodes\\- Participation Patterns\-- Form of Participation
Catching Up	Nodes\\- Participation Patterns\-- Form of Participation\Catching Up
Choosing only the relevant material	Nodes\\- Participation Patterns\-- Form of Participation\Choosing only the relevant material
Completed all of the Tasks	Nodes\\- Participation Patterns\-- Form of Participation\Completed all of the Tasks
Completing all at once	Nodes\\- Participation Patterns\-- Form of Participation\Completing all at once
Did not finish	Nodes\\- Participation Patterns\-- Form of Participation\Did not finish
Falling Behind	Nodes\\- Participation Patterns\-- Form of Participation\Falling Behind
Falling Engagement	Nodes\\- Participation Patterns\-- Form of Participation\Falling Engagement
Sporadic Involvement	Nodes\\- Participation Patterns\-- Form of Participation\Sporadic Involvement
-- Priority of Course	Nodes\\- Participation Patterns\-- Priority of Course
Easy to Deprioritise	Nodes\\- Participation Patterns\-- Priority of Course\Easy to Deprioritise
-- Strategy for organising study	Nodes\\- Participation Patterns\-- Strategy for organising study
Allowing others to find the problems	Nodes\\- Participation Patterns\-- Strategy for organising study\Allowing others to find the problems
Protected time	Nodes\\- Participation Patterns\-- Strategy for organising study\Protected time
Time of Day	Nodes\\- Participation Patterns\-- Strategy for organising study\Time of Day
-- Technology Concerns	Nodes\\- Participation Patterns\-- Technology Concerns
Not Good with Technology	Nodes\\- Participation Patterns\-- Technology Concerns\Not Good with Technology
Technical Issues	Nodes\\- Participation Patterns\-- Technology Concerns\Technical Issues
- Social Interactions	Nodes\\- Social Interactions
Can't Keep up with Discussion	Nodes\\- Social Interactions\Can't Keep up with Discussion
Confidence	Nodes\\- Social Interactions\Confidence
Discussion - Did not participate	Nodes\\- Social Interactions\Discussion - Did not participate
Discussion - not useful	Nodes\\- Social Interactions\Discussion - not useful

Name	Hierarchical Name
Discussion Forum Comments	Nodes\\- Social Interactions\\Discussion Forum Comments
Discussion Overwhelm	Nodes\\- Social Interactions\\Discussion Overwhelm
Enjoyed or Benefitted from discussions	Nodes\\- Social Interactions\\Enjoyed or Benefitted from discussions
Guilt Over Lack of Participation	Nodes\\- Social Interactions\\Guilt Over Lack of Participation
Not enough peer to peer interaction	Nodes\\- Social Interactions\\Not enough peer to peer interaction
Peer to Peer Feedback	Nodes\\- Social Interactions\\Peer to Peer Feedback
Perception of those around them at work	Nodes\\- Social Interactions\\Perception of those around them at work
Reliance on Engagement of the group for effectiveness	Nodes\\- Social Interactions\\Reliance on Engagement of the group for effectiveness
Socialising	Nodes\\- Social Interactions\\Socialising
- Student Support	Nodes\\- Student Support
Discussion Facilitation	Nodes\\- Student Support\\Discussion Facilitation
Good Facilitator Support	Nodes\\- Student Support\\Good Facilitator Support
„Course Content	Nodes\\„Course Content
.Course Visuals, Design & Format	Nodes\\„Course Content\\.Course Visuals, Design & Format
Video Content	Nodes\\„Course Content\\.Course Visuals, Design & Format\\Video Content
Visual 'Look' of the course	Nodes\\„Course Content\\.Course Visuals, Design & Format\\Visual 'Look' of the course
Adapting Content to Own Context	Nodes\\„Course Content\\Adapting Content to Own Context
Content specific	Nodes\\„Course Content\\Content specific
Instructions	Nodes\\„Course Content\\Instructions
Material Already Known	Nodes\\„Course Content\\Material Already Known
Not Suited to Audience	Nodes\\„Course Content\\Not Suited to Audience
Topic Focus or Scope	Nodes\\„Course Content\\Topic Focus or Scope
Writing Language	Nodes\\„Course Content\\Writing Language
„Learning Environment	Nodes\\„Learning Environment
Ease of Use	Nodes\\„Learning Environment\\Ease of Use
Simple Delivery Platform	Nodes\\„Learning Environment\\Simple Delivery Platform
Working Environment Caused Difficulty for Learning	Nodes\\Working Environment Caused Difficulty for Learning