To What Extent do the Different Styles of Immediate Formative Feedback Provided By OpenEssayist Help Students when Drafting Essays?

Thesis

How to cite:


© 2017 The Author

https://creativecommons.org/licenses/by-nc-nd/4.0/

Version: Version of Record

Link(s) to article on publisher’s website:

http://dx.doi.org/doi:10.21954/ou.ro.0000d28d
To what extent do the different styles of immediate formative feedback provided by OpenEssayist help students when drafting essays?

Stephen Foster

Dissertation submitted in partial fulfilment of the requirements for the degree of Master of Research in Educational Technology at The Open University

Supervisors:
Professor Denise Whitelock
Dr Simon Cross
Dr Karen Kear

Date: September 2017
Abstract

This research investigated the extent to which the different types of feedback provided by OpenEssayist helped students when drafting essays. In particular it focussed on the new rainbow diagram feedback, as research has not previously been conducted into how well students interpret the rainbow diagram in respect of essays which they have written themselves.

OpenEssayist is an immediate formative feedback system to help students draft essays. Text and graphic visualisations provide feedback to students on essay structure and content; the software does not provide a suggested mark (Whitelock et al., 2013). The rationale behind the development of OpenEssayist was to encourage students to use its immediate feedback to develop reflective practices which, through self-regulation, support essay writing and develop essay writing skills (Van Labeke et al., 2013).

Data was gathered through semi-structured interviews with six research participants from an Open University master’s level module. These interviews were analysed using Braun and Clarke’s (2006) six-phase thematic analysis process.

Data analysis produced four key findings:

i. OpenEssayist helped most participants to structure their essay.

ii. OpenEssayist helped most participants to more effectively plan and write essays.

iii. Most participants found it challenging to understand the rainbow diagram and use it to improve their essays. Participants would like further guidance on these aspects.
iv. Overall OpenEssayist can give confidence to participants that their essay is well structured and has the intended content.

The study has limitations. The small number of participants resulted in a limited spread of data, and two participants had not used OpenEssayist – though they did provide data on why they had not used it.

Although the results from the study are not generalisable, they have demonstrated that, in the context of this research an automatic writing evaluation (AWE) system can help students structure essays.
Contents

Chapter 1 – Aims and Objectives..........................................................................................1
Chapter 2 - Literature Review ..............................................................................................4
  2.0 Introduction ..............................................................................................................4
  2.1 The Role of Assessment and Feedback .................................................................4
  2.2 Assessment Challenges .....................................................................................5
  2.3 Automated writing evaluation (AWE) .................................................................8
  2.4 Open Essayist ..................................................................................................10
  2.5 Conclusion ....................................................................................................15
Chapter 3 – Methodology and Methods of Data Collection ..............................................17
  3.0 Introduction ....................................................................................................17
  3.1 Methodology and Paradigms ............................................................................17
  3.2 Research Approach ...........................................................................................19
  3.3 Research Method .............................................................................................21
  3.4 Ethics .............................................................................................................25
  3.5 Conclusion ....................................................................................................25
Chapter 4 – Collecting, Analysing and Interpreting Data ..................................................26
  4.0 Introduction ....................................................................................................26
  4.1 Data Collection ..................................................................................................26
  4.2 Data Analysis ...................................................................................................27
    4.2.1 Phase 1 – Data Familiarisation ....................................................................27
    4.2.2 Phase 2 – Generation of Initial Codes .......................................................28
    4.2.3 Phase 3 – Searching for Themes ...............................................................29
    4.2.4 Phase 4 – Review of Themes ....................................................................29
    4.2.5 Phase 5 – Defining and Naming Themes ..................................................30
    4.2.6 Phase 6 – Analysis and Interpretation of Themes .....................................31
  4.3 Conclusion ....................................................................................................41
Chapter 5 – Key Findings, Implications of Study and Conclusion .....................................42
  5.0 Summary of Aim ...............................................................................................42
  5.1 Discussion of Research Questions and Key Findings ..........................................42
    5.1.1 To what extent do the different styles of immediate formative feedback provided by OpenEssayist help students when drafting essays? ...........................................42
    5.1.2 Does OpenEssayist change the way students plan and write their essays? .......44
    5.1.3 To what extent does the ‘rainbow diagram’ help students structure essays? .....45
    5.1.4 Does OpenEssayist immediate feedback help students structure their essays? ..46
  5.2 Summary of Key Findings ..................................................................................46
  5.3 Limitations of Study ...........................................................................................48
  5.4 Implications for Future Study .............................................................................50
  5.5 Reflection on Methodology ..............................................................................51
Chapter 1 – Aims and Objectives

It is an accepted practice within higher education that students should receive feedback on their work (Lee, 2014). However, one of the challenges facing busy tutors is how to provide timely feedback which facilitates student learning (Irons, 2008). Timely feedback and the quality of that feedback is central to the students’ learning process. Helping students to learn through encouraging dialogue with feedback is an important part of a tutor’s role and feedback can play an important part in motivating students to achieve their academic goals (Irons, 2008). There is a variation in the provision of feedback by tutors and it is important to manage student expectations in respect of feedback and ensure some uniformity of process; there is no ‘one size fits all’ solution to these challenges (Irons, 2008). The research undertaken for this dissertation set out to evaluate how a small group of students used computer generated, immediate formative feedback to help them plan, write and structure essay assignments.

OpenEssayist is an automated immediate formative feedback system under development to help students with the drafting of essays. Essay summarisation and feedback on essay structure is provided through text and graphic visualisations including, for instance, a list of key words in the essay and a chart to illustrate essay structure compared with an ideal structure – a suggested mark for the essay is not provided (Whitelock et al., 2013). Hints are provided for the development of the essay via reflective questions produced for student consideration (OpenEssayist, 2017). Thus Open Essayist facilitates receipt of immediate automated feedback on a draft essay, the essay is re-drafted based on that feedback and then re-submitted to the system to obtain further feedback. The cycle of feedback and submission continues until the student is confident their essay meets the assignment criteria and submits it for summative assessment (Whitelock et al., 2015).
A new type of graphic feedback has been added to OpenEssayist. Named a ‘rainbow diagram’, it is a pictorial representation that shows how well the key concepts within the essay are connected. It was the subject of research (Whitelock et al., 2014a) to determine if participants could match the rainbow diagrams to the marks awarded to essays by tutors. The participants were asked to view the rainbow diagram and then say if it was a low-grade or high-grade essay. Research has not previously been conducted into how well students interpret the rainbow diagram in respect of an essay they have written themselves.

Van Labeke et al. (2013) identified that the rationale behind the development of OpenEssayist was to encourage students to use its immediate feedback to develop reflective practices which, through self-regulation, will support them in crafting their essay, and also develop essay writing skills. Epistemologically this rationale is supported by Bakhtin (1986, pp.106-107) who identified a “special kind of dialogue” between reflection on an object of study, such as an essay, through which “cognizing and evaluating thought takes place”. Open Essayist breaks down feedback on essay content into manageable chunks of information. This approach to learning is supported by Bransford et al. (2003) who identified that reducing the steps taken to complete a task into manageable components can facilitate learning.

Within academic literature there are claims that automatic formative feedback systems, such as Open Essayist, can promote learning. However, to date there has not been systematic research on how useful students find the different types of system feedback, text and/or visualisations, provided by OpenEssayist and how the different types of system feedback help students with the drafting of their essays; whether different students have different preferences for feedback type; how the feedback is used and whether OpenEssayist is used differently by students studying at different academic levels. Such an investigation is important because, as Nelson and Schunn (2009, p.376) identified, there
are disputes regarding “the complexity (i.e., more versus less information) and timing (i.e., immediate versus delayed) of feedback” and students must understand the feedback they receive to make good use of it. Therefore the overarching aim of this research was to investigate the extent to which immediate feedback will help students prepare essay assignments. It explicitly aimed to explore the extent to which formative feedback from OpenEssayist is used by students when writing their essays. Previous research into OpenEssayist (Whitelock et al., 2014a, 2014b) has been quantitative and this is the first occasion that OpenEssayist has been the subject of qualitative enquiry. The research objectives were to examine the use by students of immediate feedback from OpenEssayist; assess the implications of that feedback on the way students plan and write their essays; assess the extent to which OpenEssayist overall, and the new ‘rainbow diagram’ specifically, helped students structure their essays.

Therefore the following research questions were constructed to meet these objectives:

1. To what extent do the different styles of immediate formative feedback provided by OpenEssayist help students when drafting essays?
2. Does OpenEssayist change the way students plan and write their essays?
3. To what extent does the ‘rainbow diagram’ help students structure essays?
4. Does OpenEssayist immediate feedback help students structure their essays?
2.0 Introduction

Students have expressed a desire to have more formative feedback to help them prepare assignments (National Student Survey, 2016). However, the changed economies of scale within higher education as a result of ‘massification’ means that an increase in tutor contact time to meet this desire is unlikely (Field et al., 2013). One alternative is to provide automated feedback which is independent of the tutor. OpenEssayist is an automated and interactive system designed to deliver such formative feedback to students to help them write essay assignments (Whitelock et al., 2013). Feedback of the type generated by OpenEssayist can benefit students. For example, previous OpenEssayist research found a correlation between the number of drafts submitted by students and assignment marks, higher grades being obtained when more drafts were submitted (Whitelock et al., 2014b). However Whitelock et al. (2014b) suggested that the potential advantages of OpenEssayist will benefit from further exploration. The aim of this literature review is to provide a brief overview of the merits of formative feedback, highlight the research which has been conducted into the usefulness of OpenEssayist and explore some of the methodological challenges which have been identified in respect of research into automated writing evaluation (AWE) software. It will conclude that the literature indicates a need for further research into the effectiveness of formative AWE to help students with essay writing, and specifically identify that further research is required into how students use the feedback types provided within OpenEssayist.

2.1 The Role of Assessment and Feedback

Ramsden (1992) pointed out that students view assessment as being central to the Higher Education experience; this is perhaps because assessment is normally associated with recording achievement and obtaining qualifications (Timms et al., 2015). Indeed, as Orsmond et al. (2000, p.24) stated, “assessment tends to shape every part of the student
learning experience”. Summative assessment is associated with the allocation of a grade to determine the award a student will receive at the end of their programme; formative assessment is an activity which can generate feedback for a student on their learning (Irons, 2008). Formative feedback is the process through which students receive comments on their assessments with the aim of facilitating learning (Irons, 2008). Thus in a teaching context feedback is the term used to describe information received by students which informs them “about their actual state of learning or performance”, with the objective of progressing student learning (Narciss, 2013, p.8). Feedback should motivate students and encourage them to develop deep learning (Nelson and Schunn, 2009). Narciss (2013) identified that modern information technology provides the opportunity for students to receive ‘elaborate’ interactive formative feedback to help close learning gaps; in this context feedback can be viewed as an instructional activity. Formative assessment and feedback are powerful tools to facilitate learning (Irons, 2008) and meta-analysis of research has shown conclusively that formative assessment can develop learning by supporting students through the provision of feedback (Conaghan and Lockey, 2009). Students themselves, through the National Student Survey (2008, 2016), have expressed a desire to have good quality formative feedback, though Mutch (2003) has suggested that there is a variation in the uptake of feedback by students and highlighted the concern tutors have with some students not collecting feedback given on assessments.

2.2 Assessment Challenges

Field et al. (2013) pointed out that one of the challenges of distance Higher Education Institutions (HEI) is the high student drop-out rate, with the graduation rate at some HEI being less than 20%. Yorke and Longden (2004) suggested that it is quite common for students in England to leave because they have chosen the wrong module. The drop-out rate is particularly high early within module delivery and “appears to be largely due to low morale” (Field et al., 2013, p.277). Field et al. did not directly evidence this assertion,
though pointed out that some students at The Open University who have dropped-out stated they felt inadequately prepared for the module assignments (Field et al., 2013). This suggested that there is a need to provide greater support to students preparing to submit assignments. One solution would be to provide increased contact with tutors (Field et al., 2013). However the move towards mass higher education within the United Kingdom has changed the economies of scale in the sector resulting in, for example, larger tutor-to-student ratios which have reduced student contact hours with tutors (Irons, 2008); thus increased contact time with tutors is unlikely to be an option (Field et al., 2013). One viable alternative is to provide automated feedback independent of the tutor. OpenEssayist has been developed to provide such feedback, however unlike other automated assessment systems the feedback output is designed to promote self-regulated learning and to encourage the student to reflect on the content of their essay and whether it conveys the meaning they intended (Field et al., 2013). Thus the pedagogical aim of OpenEssayist is to provide meaningful “advice for action” (Whitelock, 2010, p.320).

Narciss (2013) suggested that when feedback is provided from an external source two interacting feedback loops should be considered; one based on the student, the other on the feedback source. The combination of these feedback loops Narciss (2013) identified as an Interactive Tutoring Feedback model (ITF-model) which, for example, takes account of the student's desired level of subject competency and the level of competency which their programme of study requires of them (see Figure 1).

Open Essayist enables the student to receive immediate feedback on a draft essay, re-draft their essay based on that feedback, then re-submit their essay to obtain further feedback. The cycle of feedback and submission continues until the student is satisfied that their essay meets the set learning criteria and submits it for summative assessment (Whitelock et al., 2015). To some extent the feedback cycles generated through OpenEssayist correlate
with the ITF-model developed by Narciss (2013), thereby suggesting that the ITF-model might be useful in an exploration of students’ engagement with the modes of feedback provided by OpenEssayist; perhaps, for example, assisting with an understanding of the levels of cognition which can be realised from automatic feedback (Bloom, 1979).

Price et al. (2010, p.277) identified that much “staff time and effort goes into producing assessment feedback” and noted that little research has been done into assessing its effect. They also echoed the concern of Mutch (2003) that students do not necessarily read their feedback. They cited the observations of Gibbs and Simpson (2004), Lea and Street (1998), and McCune (2004), that some students might not understand or use feedback even when it is read. Price et al. (2010) further identified the challenge of objectively measuring the effectiveness of feedback. As a start point they suggested that the student may be in the best position to judge the effectiveness of feedback, though might not always recognise its benefit.

Figure 1 Components of the Interactive tutoring feedback model (ITF-model; translated and modified from Narciss, 2006 in Narciss, 2013)
2.3 Automated writing evaluation (AWE)

Lee (2014) identified that it is important for research into feedback to consider the effect of the whole student learning experience. Indeed Lee (2014) suggested that more research is required into how students ‘self-monitor’ their own learning. Methodologically one way Lee (2014) suggested this might be increasingly done is through more qualitative approaches, perhaps through the application of ethnographic methods to obtain data from student cohorts. Lee’s (2014) observation regarding method is important because it acknowledges that educational research need not be limited to quantitative research.

Stevenson and Phakiti (2014) conducted a critical review of 36 studies into the usefulness of computer-generated formative feedback to students. They identified that AWE systems were originally developed to generate marks for high stakes assessment and that more recently they have started to be used to provide formative feedback on writing, both in universities and schools. A common feature of the different systems is that they provide users with feedback on a draft essay and offer the opportunity to re-draft the essay based on that feedback (Stevenson and Phakiti, 2014). One of their findings was that the domain of AWE pedagogical research is not particularly mature. At the time they wrote, they suggested there had been relatively little research conducted, and that some research had either not been published or had been published in unranked journals; which they suggested perhaps might indicate a lack of rigor in the research (Stevenson and Phakiti, 2014). Indeed their review found that the research had “produced mixed and sometimes contradictory results” (Stevenson and Phakiti, 2014, p.57). They commented that they felt the research they reviewed provided quite modest evidence to suggest that AWE feedback improves the quality of student essay writing (Stevenson and Phakiti, 2014).

Stevenson and Phakiti (2014) identified some methodological issues within some of the ‘within-group’ studies they reviewed. For example they cited Attali (2004) who excluded 71% of his data set because no re-drafting was undertaken by these participants.
Stevenson and Phakiti (2014) suggested that for over two-thirds of a cohort not to make use of AWE software provided to them raises a question regarding the extent to which AWE software is able to stimulate students to produce essay drafts. They also highlighted that the lack of a control group for within-group comparisons makes it more challenging to conclude that improvements made to an essay in successive drafts were a product of software use rather than the development of the students’ own redrafting skills over time (Stevenson and Phakiti, 2014). For the ‘between-group’ comparisons, over half of the research reviewed showed “either mixed or no effect for AWE feedback on writing outcomes” (Stevenson and Phakiti, 2014, p.60). Furthermore Stevenson and Phakiti (2014) observed that some studies appeared to ignore negative results and drew more optimistic conclusions about AWE than the data warranted. For example, Schroder et al. (2008) researched the effectiveness of Criterion software on a writing course related to criminal justice. Three groups used Criterion, however one of them did not obtain significantly higher final marks than the control group; possible reasons for this were not discussed in the paper and very strong conclusion in favour of Criterion was drawn from the research (Schroder et al., 2008). Three of the ‘between-group’ studies looked at AWE feedback in comparison to tutor feedback. The evidence produced from the studies was mixed; however, perhaps significantly, none of them indicated that AWE was less effective than tutor feedback (Schroder et al., 2008), which Stevenson and Phakiti (2014) suggested might be positive.

Stevenson and Phakiti (2014) made some pertinent observations from their review. They suggested that there appeared to be a lack of research evidence as to whether general improvements in essay writing might be associated with the use of AWE. Furthermore even if research showed that students successfully used AWE feedback, this does not of itself demonstrate that AWE had improved students’ reflective abilities or the development of a meta-cognitive ability which would allow them to apply the skills of evaluation and
correction to other essay texts (Stevenson and Phakiti, 2014). Interestingly they suggested that little is known about whether AWE software does actually promote independent revision of texts. Indeed they cited Attali (2004) again, to suggest that there is evidence that AWE software does not facilitate re-drafting, pointing out that in addition to 71% of Attali’s students not re-drafting, 48% of the remaining students who did redraft, did so only once. Warschauer and Grimes (2008) also suggested that students might not re-draft more than once. Stevenson and Phakiti (2014) went onto state that some students might not possess the re-drafting skills necessary for them to benefit from the re-drafting opportunities provided by AWE. There is however, evidence to suggest that AWE can facilitate re-drafting and improvement in student marks; as demonstrated by Whitelock et al (2014b) through their research into OpenEssayist.

2.4 Open Essayist

OpenEssayist is an automated and interactive system which delivers immediate formative feedback to students writing summative essays (Whitelock et al., 2013). It consists of a linguistic analysis engine, which uses Natural Language Processing (NLP) to analyse the words within an essay and generate feedback (McNamara et al., 2013), as well as a web application for delivery of feedback. The feedback is provided through the following text and graphic visualisation types:

**Essay Feedback Component** (See Appendix A, Figures 1 and 2)

- Highlight key words
- Highlight key sentences
- Highlight key words and sentences
**Analysis Feedback Component** (See Appendix A, Figures 3-5)

- Show extracted key sentences (by importance; by text order)
- Show extracted key words and phrases
- Organise key words

**Graphic Feedback Component** (See Appendix A, Figures 6-10)

- Show key word ‘word cloud’
- Show key word dispersion plot
- Show word count structure chart
- Show word limit comparison
- Show word count comparison
- Rainbow diagram

The ‘essay’ feedback component provides students with a representation of their essay, identifying what the system considers to be the essay introduction, discussion and conclusion, and providing the option to highlight within the essay the ‘key words’ and ‘key sentences’ identified by OpenEssayist (Whitelock et al., 2015). The ‘analysis’ feedback component extracts the ‘key words’ and ‘key sentences’ from the essay and provides an option to organise them. This gives the student an opportunity to reflect on whether their essay contains the key concepts and arguments which they intended (Whitelock et al., 2015). The graphics feedback component provides two visual representations of the ‘key words’. They can be displayed in a ‘word cloud’ or through a dispersion plot which shows the distribution of key words within the essay. The graphics component also displays two visualisations of the word count, a pie chart and bar chart, which indicate how many words are in the introduction, discussion and conclusion; the bar chart also indicates the essay word limit. Additionally, it contains the new rainbow diagram.
Development of a graphical rainbow diagram for OpenEssayist followed on from research conducted in 2013 (Whitelock et al.) when it was found that the more complex visualisation feedback types within the system at that time were challenging for users to comprehend. As Wise et al. (1995, p.58) pointed out, “the success of other text visualisations will likely be determined by whether the user can manipulate them along the lines of their analytical intuitions”. The rainbow diagram uses graph theory to identify key sentences in an essay. Each node (dot) on the rainbow diagram represents a key sentence or a sentence which has some relevant words in common with at least two other sentences (Whitelock et al., 2014a). The node which represents the introductory sentence will be ‘violet’ in colour. The node which represents the concluding sentence will be ‘red’ in colour. Sentences towards the beginning will be shades of ‘violet’ and sentences towards the end will be shades of ‘red’. An algorithm places a line between one node and other node when the same relevant word appears in the sentence represented by each node (Whitelock et al., 2014a). The algorithm compares each sentence “with every other sentence, and a value is derived representing the semantic similarity of that pair. That similarity value becomes a weight that attaches to the edge [line] that links the corresponding nodes in the key sentence graph”, and thereby determines how close one node is to another (Whitelock et al., 2014a, p.3). In a well-structured essay the nodes will be close to each other and nodes of similar colours might be near to each other, towards the centre of the diagram (see Figure 2). This is because the sentences associated with the introduction (violet nodes) are grouped near to the nodes associate with the conclusion (red nodes) (Whitelock et al., 2014a). In a less-well-structured essay the nodes will tend to be more dispersed, with the red nodes towards the outside of the diagram and the violet nodes toward the centre (see Figure 3). An early essay draft might have more dispersed nodes. When an essay is re-drafted and refined the nodes in the rainbow diagram should become
more central, thereby suggesting that re-drafting might have improved the structure of the essays content (Whitelock et al., 2014a).

Figure 2 Rainbow diagram, OU essay awarded a high grade (Whitelock et al, 2014a)

Figure 3 Rainbow diagram, OU essay awarded a low grade (Whitelock et al, 2014a)

In 2014 (Whitelock et al., 2014a) research was conducted into the usability of the rainbow diagram. The study involved 24 participants, predominantly university staff and PhD students, who were provided with instructions on the meaning of different rainbow
diagrams and were then presented with a series of rainbow diagrams to interpret. It demonstrated that the instructions provided were able to convey the meaning of the rainbow diagrams to the extent that all participants interpreted the test diagrams correctly (Whitelock et al., 2014a). Furthermore the participants agreed that the rainbow diagrams helped them in “understanding the structure of a good essay” and that overall the diagrams, and the colours within them, demonstrated to the participants how to “improve the connectedness of concepts” within an essay (Whitelock et al., 2014a, p.8). Whitelock et al. (2014) were surprised that the research participants all interpreted the test diagrams correctly, due to the problems research participants experienced comprehending the previous complex visualisations within OpenEssayist. They went onto point out that further research was needed to understand how the rainbow diagram helps students (Whitelock et al., 2014a). To date research has not been conducted to establish how useful the rainbow diagram is to students drafting essays for assessments and whether the level of study a student is engaged with has an impact on their comprehension of the diagram; for example, to what extent might both first year students and post-graduate students find the diagram useful? The latter observation is relevant as it is acknowledged that students start educational courses with different levels of understanding and experience of learning, and have different levels of motivation (Whitelock et al., 2016).

Reflective hints are available offering advice on how to use the different feedback types (Whitelock et al., 2014b). Feedback hints of the type generated by OpenEssayist can benefit students (Whitelock et al., 2014b). For example, in the academic year 2013-14 OpenEssayist was provided to a cohort of Open University post-graduate students as part of H817, a post-graduate master’s level module titled ‘Openness and innovation in elearning’. Analysis of data obtained from OpenEssayist in respect of student submission of drafts for their first summative assignment showed a significant positive correlation between the number of draft essays students submitted and their assignment mark.
(Whitelock et al., 2014b). While this does not establish a causal relationship, it might suggest that students who submitted more drafts when preparing their assignment got higher marks or perhaps that students who got higher marks also “engaged more with the process of submitting drafts” (Whitelock et al., 2014b, p.10). During this research students had access to all of the current OpenEssayist feedback types, except the rainbow diagram. Administrative data from OpenEssayist enabled a review of the feedback types which had been accessed most by students. The most used types were those linked to the ability of OpenEssayist to summarise an essay through the identification of ‘key words’. One example of a popular ‘key word’ visualisation was the ‘word cloud’, which provides a pictorial representation of how often the ‘key words’ identified by the system occur in the essay (Whitelock et al., 2014b). One student was interviewed regarding their use of OpenEssayist and expressed an expectation that OpenEssayist feedback would be ‘a mark’ for the assignment. He stated that subsequently he realised the value of the ‘key sentences’ feedback to help structure and divide the essay, and that his marks improved (Whitelock et al., 2014b). Overall Whitelock et al. (2014b) concluded that the potential advantages of OpenEssayist will benefit from further exploration.

2.5 Conclusion

The research is situated within the academic spheres of assessment, feedback and automated writing evaluation (AWE). The literature has suggested that that modern information technology, such as OpenEssayist, provides the opportunity for students to receive elaborate interactive formative feedback to help close learning gaps (Narciss, 2013). Significantly the review has identified some methodological issues within previous research into AWE and identified that research results into formative AWE has been mixed, though none of the research indicated that AWE was less effective than tutor feedback (Stevenson and Phakiti, 2014). There does appear to be a lack of research evidence as to whether general improvements in essay writing might be associated with the
use of AWE, rather than a development of students’ own ability; and potentially even if research showed that students successfully used AWE feedback, this might not demonstrate that AWE had improved students’ reflective abilities (Stevenson and Phakiti, 2014). It has been identified that OpenEssayist would benefit from further research into how students make use of the different types of feedback (Whitelock et al., 2014b). Whitelock et al. (2014a) identified that the rainbow diagram is a new type of feedback within OpenEssayist and that research is needed into how students make use of it and the extent to which instruction might be required by students for their successful use of this new feature. The research questions which were the subject of this research derive from the research gaps identified in the literature, and the findings from this study facilitate a step towards filling those gaps.
3.0 Introduction

Punch (2009) identified that a research enquiry should reflect the assumptions it makes about the form and nature of reality adopted by the researchers to address the problem, and employ methods which are appropriate to the study of that reality. Chapter 3 sets out the philosophical underpinning of this research project by highlighting some of the different understandings of reality and then explaining why the research methodology chosen was the most appropriate one. It will then discuss the research method used and highlight some of the ethical considerations the method entailed.

3.1 Methodology and Paradigms

There is a range of ontological positions about how the world is constructed. For example, objectivists consider social entities to be separate entities while constructionists suggest that social entities can only be understood in respect of the social actors who construct them (Bryman, 2012). Bryman (2012) illustrated this with reference to an organisation. Objectivists would see an organisation as an entity in its own right, with its own rules and regulations through which it can exert pressure on people to conform to organisational requirements. Constructionists would argue that organisations and culture do not exist separately from the social actors which form them; that rules and regulations are constantly changing and evolving. Alternately postmodernists would question concepts such as objectivism and constructionism, instead suggesting there is no objective reality waiting to be revealed; reality will always be accessed through narratives (Bryman, 2012).

There are a range of competing epistemological perspectives on how the world should be understood. For instance, positivists suggest that the social world should be studied using similar methods to natural scientists, where measurement and the control of variables facilitates discovery of casual relationships (Bryman, 2009). However interpretivists view...
the social world as different from the natural world, and suggest that to comprehend it sense must be made of the way in which people actively interpret the world around them (The Open University, 2009).

Epistemological perspectives flow from ontological perspectives. Therefore a positivist epistemology following on from an objectivist perspective might seek empirical facts that directly relate to reality, while an interpretive epistemology following on from a constructionist perspective might seek to understand how people construct their ideas of the social world (Giacomini, 2012). Respective epistemological positions lead to research paradigms about how data might be gathered. Quantitative research tends towards a positivist epistemology and usually seeks relationships in structured data, such as survey results, through statistical analysis, while qualitative research tends towards an interpretive epistemology and tends to gather unstructured data, perhaps through observation or document analysis; though may subsequently structure data, through coding, to facilitate analysis (The Open University, 2009). However whilst ontological and epistemological perspectives might be mutually exclusive, this is not always the case with quantitative and qualitative analysis. Brannen (2005) identified that combining quantitative and qualitative approaches in a single mixed method research strategy is increasingly prevalent and cited the increase in conferences and publications on mixed methods research to evidence her point. She further suggested that interest in mixed methods has been caused by a number of factors, the desire amongst researchers to enhance their skills, a greater appreciation of mixed methods research as a result of researcher training and a desire to ‘think outside the box’ (Brannen, 2005). However mixed methods research does have critics who argue that such a methodology is not always “appropriate or desirable” (The Open University, 2009, p.77).
In quantitative research it is often the aim of researchers to demonstrate that their work is generalisable. Quantitative researchers therefore look for their research results to be reliable and capable of replication when similar research is conducted with different research populations (Braun and Clarke, 2008). Reliability and replicability tend to be associated with the positivist ontological view of the world which recognises a single view of reality (Braun and Clarke, 2008). This means that reliability and replication are not concepts which lend themselves to a constructionist view of the world, which recognises multiple realities. The concepts of reliability and replicability therefore are not considered suitable for judging qualitative research (Braun and Clarke, 2008). However, if reliability is thought of in broader terms, such as ‘dependability’ of data collection and analysis, then it is possible to judge the extent to which qualitative research has credibility (Braun and Clarke, 2008). The idea that trustworthiness in qualitative research can be thought of in different terms from trustworthiness in quantitative research, is supported by Lincoln and Guba (1985). They pointed out that credibility, transferability, dependability and confirmability have a better fit with naturalistic epistemology than respectively, internal validity, external validity, reliability and objectivity. Thus, just as there can be “no validity without reliability”, for qualitative research there can be “no credibility without dependability”, and a “demonstration of the former is sufficient to establish the latter” (Lincoln and Guba, 1985, p.316). Cohen et al. (2011) suggested that one way to demonstrate credibility is through a comprehensive literature review which, for example, highlights the key areas the research explores; a process which was adopted for this piece of research.

3.2 Research Approach

The aim of this project was to seek students’ views on the extent to which the formative feedback types within OpenEssayist helped them craft essays and develop knowledge of essay structure. This implied a view of the reality that is constructivist and that it is
possible to obtain data on how students interpret feedback to make sense of the requirements of essay writing and develop their understanding of essay structure. Thus the research took an interpretive, inductive approach; theories in answer to the research questions came from data gathered through semi-structured interviews.

A survey and ethnography were other methods considered as a means of data collection. Surveys can capture relevant data at a specific point in time, though are typically suited to gathering data from a large population to make measurements or obtain general descriptions. Such data is often associated with positivist perspective of the world (Cohen et al., 2011), rather than the constructivist perspective this research adopted. Surveys can vary in terms of their scope and complexity, for example surveys can gather numerical data and standardised information, and also descriptions. Students had not previously been interviewed regarding their experience of OpenEssayist feedback. As one of the aims of the research was to seek student views on that feedback and probe their responses, in this instance, a survey instrument was not considered appropriate. One ontologically and epistemologically appropriate method considered was ethnography; which tends to be inductive, with theory developing from research results (The Open University, 2009). The master’s module from which the research population was drawn made use of web forums and the collection of data from such forums, ‘virtual ethnography’, is a recognised way of obtaining data from digital communities (Hammersley and Atkinson, 2007). However ethnographic studies tend to be prolonged and it was considered that the limited period available for project data gathering was too short a time to gather meaningful data. In addition, OpenEssayist was not a component part of the module and there might be, and subsequently was, a relatively low uptake in its use.
3.3 Research Method

If research is not credible, then as Cohen et al. (2011) pointed out, the research is useless. Hammersley (2017) identified that one consideration affecting credibility is the extent to which the kinds of data obtained answer the research questions and whether the analytical processes employed are suitable. Data to answer the research questions was gathered through semi-structured interviews with research participants from an Open University master’s level module. The predominant rationale for using the particular module was that the module presentation matched the research timetable and that the assignments were of a type for which OpenEssayist was tested. The interviews were digitally recorded. The digital files were transcribed and the data coded using NVivo software. Braun and Clarke’s (2006) six-phase process was used to conduct a thematic analysis.

Semi-structured interviews were chosen because the data sought was intangible. For example, as Bell (2005) pointed out, a survey can answer ‘what’ questions but ‘why’ questions might prove more challenging – the use of semi-structured interviews helped to address this failing and gave participants the opportunity to state why they held a particular opinion regarding OpenEssayist feedback. Furthermore, interviews provide the opportunity to prompt participants who have difficulty in answering a question, and where necessary to probe participants to elaborate upon an answer (Bryman, 2012).

Cohen et al. (2011) identified that the interview is a powerful research tool, capable of capturing many forms of data. Dependent on whether the interview is face-to-face or via a telephone the data collected might be spoken, heard, verbal and non-verbal. However Van den Berg et al. (2003, p.3) pointed out that, in interviews which seek to obtain data which is applicable to the world outside the context of the interview, there is a “crucial assumption” that what a respondent says is applicable outside the context of the interview. Respondents might not accurately recall past events and there is the possibility that
responses might not be truthful; though, as Van den Berg et al. (2003) observed, what
counts as truth is socially negotiated. Similarly the interviewer might influence interviewee
responses. In consequence, unless researching *how* something is said, it is common to
ignore the “local construction” of interview data which occurs through the interaction of
interviewer and interviewee within the interview context, and to assume that this will not
cause error (Van den Berg et al., 2003, p.4). Nonetheless when analysing interview data it
is important to take into account that it is the product of a social interaction and is a joint
collaboration between interviewer and interviewee; thus the researcher must, for example,
consider whether an answer given to a poorly phrased question might have elicited an
inaccurate or untruthful response which could skew analysis (Van den Berg et al., 2003).

Some researchers, influenced by naturalism, favour non-directive interviewing and believe
that more accurate accounts are obtained if interviewees are permitted to speak at length
without interruption, thereby seeking to mitigate, as far as possible, the influence of the
interviewer on the interviewee’s account (Hammersley, 2007).

For this research project a list of questions and interview topic areas was prepared (see
Appendix B). The list formed a framework for the conduct of interviews and provided a
means through which the interviewer managed the interview, for instance, noting which
questions and topic areas had been covered. This was important because the interviewer
probed topic areas as they arose. For example, although questions pertaining to training in
the use of OpenEssayist were scheduled towards the end of the interview, in practice this
topic area often arose towards the beginning, sometimes as a result of a participant
indicating that they did not understand how to use a particular feedback type embedded
within OpenEssayist.

To help research participants reflect and recall their use of OpenEssayist, and thereby
facilitate accurate answers and help mitigate the potential for error highlighted by Van den
Berg et al. (2003), research participants were provided with an interview guide before the interview took place. Rivard et al (2014) pointed out that it can be difficult for people to recall events, and within investigative interviewing processes are used which help interviewees to remember. For example, cognitive interviewing is a technique developed by Fisher and Geiselman (1992 in Fisher et al., 2000) to help interviewees accurately recall what they have seen. The use of the interview guide, which included screen shots of the different OpenEssayist feedback types, was viewed as a way to enhance recall by encouraging interviewees to approach recall from several perspectives (Anderson and Pichert, 1978).

Data were coded using NVivo and then thematically analysed. Thematic analysis is a procedure for identifying and interpreting patterns within qualitative data (Clarke and Braun, 2017). It can be viewed as a “foundational method for qualitative analysis” and is compatible with the constructionist paradigms adopted by this research (Braun and Clarke, 2006, p.78). A ‘theme’ within thematic analysis provides important information from the data which will address the research questions asked (Braun and Clarke, 2006). However there are no ‘rules’ to define what a theme is or how big an element of data it should comprise (Braun and Clarke, 2006). Furthermore Braun and Clarke (2006, p.81) pointed out that thematic analysis has the advantage of flexibility and “is not wedded to any pre-existing theoretical framework, and so it can be used within different theoretical frameworks (although not all), and can be used to do different things within them”. Within this research, themes emerged from coded data; the data was obtained by interviewing participants about their use of OpenEssayist feedback.

In order to make relevant use of the interview data that was collected, each data recording was textually transcribed verbatim. For each transcript, the introductions at the start of the interview were omitted in order maintain the anonymity of research participants.
McLellan et al. (2003) identified the importance of deciding what should be transcribed and what should be left out, as this is an initial stage of data reduction. They pointed out that a decision is required as to whether a transcript should be verbatim, or perhaps also record intonations or vernacular expressions (McLellan et al., 2003). In this instance the object of the analysis was to identify themes. There was no intent to analyse the conversation itself, through the techniques of discourse analysis, thus a complete transcript identifying features such as intonations and pauses was not required.

Data analysis was conducted using Braun and Clarke’s (2006) six-phase process. The audio files and transcripts were reviewed, NVivo was used to generate codes from the transcribed data, possible themes were generated from the codes, the initial themes were reviewed and then defined, after which the analysis chapter was written. The analysis of transcripts through NVivo facilitated greater dependability as it allowed the transcripts to be directly coded and for the codes to be arranged in hierarchies (Cohen et al., 2011). NVivo was chosen in preference to a web-based application, such as Dedoose (Silver and Lewins, 2014), to facilitate working when internet access was not available and to avoid the potential for online data to be stored outside of the privacy protection of the European Union. Additionally, as the coding was not undertaken by more than one person and mixed methods were not being employed, some of the advantages of using Dedoose would not be realised. The research did not make any claims of generalisability as the object of the research was solely to obtain the views of participants; though subsequent research might identify whether those views are representative of the views of others. Originally a ‘within group’ statistical comparison of assignment marks between users and non-users of OpenEssayist within the cohort was planned. However the low uptake of use of OpenEssayist by the cohort overall meant that the number of OpenEssayist users did not facilitate a statistically significant comparison.
3.4 Ethics

The research method required collection of data from human respondents and therefore adhered to The British Psychological Society (2014) guidelines and the ethical guidelines of The Open University (2014). The research was registered with The Open University. Students were provided with a letter setting out the object of the research and inviting them to participate (see Appendix C). Written consent (see Appendix D) was obtained from students in respect of their participation which included written consent for the recording of telephone or face-to-face interviews. Confidentiality was maintained regarding the source of data and data was physically secured to prevent loss or personal compromise. No personal information was requested from students beyond that necessary for them to give permission to use the data they provided. All the participant derived data published within this dissertation is anonymous; any participant data published in future papers will also be anonymous. To ensure equality of opportunity all students on the module from which the research participants came had access to OpenEssayist and the option to use it regardless of whether they volunteered to participate in the research.

3.5 Conclusion

This chapter has outlined the ontological and epistemological framing of this research and stated why qualitative interviews were chosen over survey methods to obtain the necessary data for this research. It has explained why thematic analysis was undertaken and highlighted the methods used to conduct that analysis. The ethical framework within which the research was undertaken has been outlined.
Chapter 4 – Collecting, Analysing and Interpreting Data

4.0 Introduction

Chapter 4 considers the process of data collection and analysis. It explores the themes which emerged from coding of the data, and also introduces data from the interview transcripts to evidence those themes. Each theme is discussed and, where appropriate, related to previous research on OpenEssayist and AWE.

The research participants were drawn from an Open University master’s level module which had a cohort of thirty students. Of these, fifteen students were not available as participants, for reasons connected with the student participant guidelines set by the Open University Student Research Project Panel (SRPP). The remaining fifteen students were approached as potential research participants. Six students responded to an invitation to take part in the research and were subsequently interviewed, of whom four used OpenEssayist. Within this dissertation the six research participants are referred to by the abbreviations RP1 to RP6; participants RP4 and RP5 did not use OpenEssayist.

4.1 Data Collection

Fifteen students were approached as potential research participants, all from an Open University master’s level module. Six students responded to an invitation to take part in the research, of whom four used OpenEssayist. The research participants were interviewed either face-to-face or via telephone during May 2017. The interviews were conducted about the time students completed the second of their module assignments, this provided students with the opportunity to obtain and reflect on OpenEssayist feedback from two assignments. It also enabled data collection to occur within the research timetable and provided a richer data set than would have occurred had students been interviewed after their first assignment. When arranging interviews, it was found that two students had not
used OpenEssayist. Both students were subsequently interviewed and data obtained from them included the reasons why they had not used OpenEssayist.

The interviews were digitally recorded using two recording devices. This resulted in the generation of two digital recording files and provided a contingency in the event of one recording device not functioning correctly. Two of the interviews were face-to-face and took place at in a meeting room at the Open University campus in Milton Keynes. Four interviews were conducted on the telephone with the conversation taking place on ‘speaker’ to facilitate recording. The interview audio files were sent for professional transcription prior to analysis.

Two of the research participants had not used OpenEssayist and were therefore not asked questions about their use of the system. Instead their interviews focussed on questions relating to what the participants understood were the requirements of an essay, how they structured their essays, and how they planned and wrote an essay. This provided baseline information on how students approach the process of essay planning and writing.

4.2 Data Analysis

The data analysis was conducted using Braun and Clarke’s (2006) six-phase process for thematic analysis. The process and how it was used is discussed within this section.

4.2.1 Phase 1 – Data Familiarisation. Braun and Clarke (2006) pointed out that thematic analysis does not require the same level of detail in an interview transcript as, for example, conversation or discourse analysis. Though they suggested that, at a minimum, a verbatim account of verbal utterances should be produced. This advice was followed and a verbatim account of the audio files was professionally transcribed. However it is important for a researcher to become familiar with their data through immersion, which is usually
achieved through ‘repeated reading’ of the data (Braun and Clarke, 2006). Thus the audio files were reviewed, the audio transcripts read, and the transcriptions checked against the audio files for accuracy. Whilst reading the data ideas were formed about what was in it and what was interesting in relation to the research questions. For example, it was interesting that one research participant said that using OpenEssayist meant they did fewer drafts because the feedback received enabled them to go directly to where change was required in their essay.

4.2.2 Phase 2 – Generation of Initial Codes. This is the first phase of analysis in which codes are produced from the data (Braun and Clarke, 2006). The interview transcripts were uploaded to NVivo. Each transcript was re-read with the aim of encoding the entire data set to provide a broad base for the emergence of themes. Codes were produced based on the semantic content of the interview. For example, RP1 said that OpenEssayist “has given me a bit more of a better visual idea about what I’ve got to write”, ‘visualisation’ became a code against which data was collated. Similarly, RP1 said that through OpenEssayist they became “aware of where I was saying the same thing”; ‘awareness’ became a code. Subsequently when a research participant said something relating to visual feedback or awareness, that statement was coded accordingly. For instance, RP2 said, “I think I’m a lot more aware of how I need to be structuring an essay [...]”, this statement was coded to ‘awareness’.

Bryman (2012) pointed out that context can be lost in coding. To mitigate against this, Braun and Clarke (2006) advised the researcher to keep some of the data which surrounds the coded extract. This advice was followed and coded text was extracted with surrounding data to give context. Furthermore NVivo allows primary codes to have secondary codes created within them to produce a ‘code’ hierarchy which helps refine analysis. For example, ‘how to use feedback’ was created as a secondary code within the code
‘feedback’ and any data relating to ‘how to use feedback’ was coded to the secondary code; thus allowing such data to be easily identified whilst overall keeping it coded to ‘feedback’.

4.2.3 Phase 3 – Searching for Themes. Braun and Clarke (2006, p19) identified that the third phase of analysis involves “sorting the different codes into potential themes, and collating all the relevant coded data extracts within the identified themes”. Thus once the data had been coded a ‘mind map’ was used to arrange the codes into potential themes and an initial list of possible themes produced. Braun and Clarke (2006, p.82) stated that a theme “captures something important about the data in relation to the research question, and represents some level of patterned response or meaning within the data set”. Thus the themes identified, as well as reflecting intensity and frequency of occurrence, also reflected the research questions. A Word document was used to collate all the coded data from each theme in one place.

4.2.4 Phase 4 – Review of Themes. Braun and Clarke (2006) suggested a two-level review of themes. Level one involved reviewing the coded data extracts collated for each theme to determine whether the extracts formed a coherent pattern. For this level one review the coded data collated under each theme was reviewed within the Word document. The data appeared to form a coherent pattern, which matched the themes, and the analysis moved onto level two.

At level-two Braun and Clarke (2006) stated the entire data set should be reviewed to ascertain whether the themes ‘work’ for the data set and to code any data missed in the earlier coding. Most of the data from the research participants who used OpenEssayist was coded. However less data was coded from the research participants who had not used OpenEssayist. This was because that data did not containing the same level of information
regarding OpenEssayist feedback. Overall, after the data set had been reviewed there were twenty primary codes and eleven secondary codes.

4.2.5 Phase 5 – Defining and Naming Themes. For phase five the theme mind map was redrawn to reflect the additional codes generated from phase four. Braun and Clarke (2006) identified the importance of considering how each theme fits into the overall ‘story’ to be told about the data, and during this phase it was realised that one of the themes, ‘OpenEssayist guidance’, was a low-level theme which had a large overlap with the theme ‘rainbow diagram’; the ‘mind map’ was therefore further refined and the theme ‘OpenEssayist guidance’ removed. This process left the following themes extant:

1. Essay structure support
2. Provided confidence
3. Essay planning
4. Essay summary
5. Most useful feedback types
6. Rainbow diagram

Figure 4 is the final thematic mind map, and shows which themes emerged from which codes. It illustrates that some of the codes facilitated the emergence of more than one theme; for instance, the same three codes, ‘structure’, ‘awareness’ and ‘visualisation’, facilitated the themes of ‘essay summary’ and ‘essay structure support’.
4.2.6 Phase 6 – Analysis and Interpretation of Themes. Braun and Clarke (2006) identified the final phase of thematic analysis as the write-up of that analysis. Therefore the following five sub-sections each discuss the findings in relation one of the themes identified in phase 5.

4.2.6.1 Essay structure support. Students were asked about the extent to which OpenEssayist helped them structure their assignments. All the students who used OpenEssayist felt that it had helped them to varying degrees with structuring their essays. For example, RP 2 said that they were not confident with structuring an essay and that OpenEssayist had helped; by, for instance, identifying word repetition. OpenEssayist, through the summarisation process, enabled RP2 to identify repetition and re-structure their essay; this had the benefit of more easily allowing them to remain within the assignment word limit. RP2 also said that OpenEssayist helped them to focus on writing, and commented that the immediate feedback provided the opportunity to reflect on what they had written and make amendments to improve the essay, something not possible from
post assignment tutor feedback. Thus, they felt that overall OpenEssayist had helped them write a better essay than they might otherwise have done, both in terms of structure and content. RP2’s comments demonstrate OpenEssayist meeting its pedagogical aim of providing meaningful “advice for action” (Whitelock, 2010, p.320).

RP1 obtained a much higher mark on their first assignment, relative to past performance, than anticipated. They attributed this higher mark to use of OpenEssayist, stating “[…] I got a higher mark, now if I hadn’t used OpenEssayist […]”. They felt that OpenEssayist had acted as a ‘scaffold’ which facilitated the crafting of a better answer – the visual feedback provided a summary of what had been written and allowed them to focus their writing towards the assignment objectives. RP3 also commented that they felt OpenEssayist could act as a framework to help structure an essay, and said “[…] so I copied a lot of my blog post and rearrange that into an essay structure and started with that so it’s a combination of blogs also helped me to get writing early then OpenEssayist to put that in a one framework let’s say”.

It is not possible to conclude that RP1’s higher mark for their first assignment was due to OpenEssayist. There are many reasons why their mark might have been higher, including an increase in their subject knowledge; this was not the first master’s level module that they had undertaken. However, RP1 said that prior to their current MA programme they had not written an essay since school, some 20 years ago, thus suggesting that OpenEssayist might have helped them develop their essay writing. RP1 strongly felt that OpenEssayist did improve their mark and they will be re-interviewed on completion of their module to assess whether they feel that OpenEssayist had continued to help them achieve higher grades.
Previous quantitative research (Whitelock et al., 2015) found that a cohort of students who used OpenEssayist got significantly higher overall marks than a previous cohort who did not. However, as with RP1, there may be other reasons for this outcome, such as different demographics between the cohorts. Furthermore, Whitelock et al. (2016) found no evidence to suggest that feedback on both the structure and content of an essay led to a higher mark; though participants in the research undertaken for this dissertation felt that such feedback helped them.

4.2.6.2 Provided confidence. Figure 4 shows that some of the codes which support the theme of ‘structure’ also support the theme of ‘confidence’. Perhaps this overlap is best illustrated by RP2 who said they were “not really confident about how to structure an essay, and that’s where this [OpenEssayist] has helped”, and RP6 who said, “[…] there is a structure behind that, the essay and what sort of key sentences and key words highlighted, that gives you the confidence, I have covered the topic”. RP6 felt that OpenEssayist had helped them with their essay structure and that being able to see the highlighted key words and key sentences gave them confidence that they had covered the topic areas required within the assignment. Thus OpenEssayist, in helping students correctly structure an essay, also gave them confidence in the correctness of their essay content – though confidence was not always explicitly stated in the data, some statements were interpreted as illustrating confidence. For example, RP2 commented that, “before that, your essay is handed in, you have said it then by then it’s too late to go back and reflect on what you can reflect on but you can’t change it, I think that is the most important that it [OpenEssayist] gives you that opportunity to get feedback making improvement”.

RP1 thought that OpenEssayist had given them a “bit more of [better] visual idea about what I have got to write”. Prior to starting their current study programme, they had last
received formal education at school. OpenEssayist, through its types of summarisation, and the highlighting of an introduction, main body and conclusion, gave RP1 confidence that they had not gone ‘off track’ with the assignment. Thus, OpenEssayist gave confidence to a less experienced student that they could write a well-structured essay. The idea that OpenEssayist might give confidence to students who have less experience is supported by comments from other research participants. RP6 said, “Well for, I would say I really liked the idea of this tool because I think, especially for students starting out almost being uncomfortable writing essays it could really help them work on the structure of the essays and understand how it works and how it also links together”. Thus RP6 felt that OpenEssayist would be useful for students ‘starting out’ who were ‘uncomfortable’ with writing essays, as OpenEssayist could help them work on the structure of their essays and more readily link the different elements together. RP4, who had teaching experience, suggested that essay structuring is a challenge for most students, commenting that, “I think any level of study there are students that would benefit from help with structuring their essays I think […] students from level 1 right thought to master’s, structure is the main problem with the majority of students”.

OpenEssayist offers a solution to the observation of Whitelock et al. (2013) that OU students returning to study following a break of over ten years do not receive formal support in essay writing. However not all participants felt OpenEssayist gave them confidence. RP3 identified that, in their context, it did not. However, RP3 also identified that they were highly confident in their essay writing skills to start with. They went onto suggest that OpenEssayist might be useful for students starting their studies, though did point out that such students might need support as they wrote each element of their essay; in its current form OpenEssayist is designed to provide feedback on whole essays.
The comments of RP1 and RP6 suggested that OpenEssayist can provide confidence in two separate, though linked, ways; confidence that an essay is correctly structured and confidence that it has covered the topics areas required in the assignment. To establish conclusively if OpenEssayist would give confidence to students studying at different levels, it would be useful to undertake research across the different levels of HE study.

4.2.6.3 Essay planning. All six participants undertook their essay planning and writing in slightly different ways. Overall they all undertook some form of planning process based on the essay criteria and then wrote iterations of their essay, either in draft versions or as a ‘living document’ which they reviewed and changed. For example, RP3 commented, “Yeah, I don’t work that way to be honest [produce drafts]” and RP6 said, “I don’t think it has changed the way I am writing the essay plan […] I have been using it basically in the end process”.

With perhaps the exception of RP1, the data did not suggest that OpenEssayist had significantly changed the way students planned and wrote their essays, though it had perhaps made that process more efficient. RP1 commented that they found the key words particularly useful for reviewing essay content and that they had done more drafts. This is perhaps significant, as RP1 was less experienced; thus suggesting that, for similar students, OpenEssayist might provide a framework for crafting an essay. The data suggested that whether OpenEssayist significantly changes the way students write an essay might depend on their experience, and that greater changes might be made by students less experienced in essay writing. This perhaps reflects Narciss’s (2013) ITF-model, with OpenEssayist providing feedback on the structure and content of an essay and the student comparing that feedback to what they desire to write, then making corrections and repeating the feedback process. For example RP1 said, “I would have done about just two [drafts], and then would
have thought right, I’m going to submit it now, but now that’s changed, I think it’s going to become a bit of a game changer for a lot of students because you rely on your tutor’s feedback to come back to you and, but that might be too late for the TMA and you know results […]”.

One surprising finding, which also links to the theme of ‘summarisation’, is that RP2 wrote fewer drafts when using OpenEssayist, commenting that, “yes, less drafts because it’s given me the feedback to be able to get straight to where I need to change, whereas before I didn’t have that so I just relied on other people reading it and thinking I needed to change so it drastically reduced the amount of drafts I did”. Previous research conducted using an OU master’s level module found a correlation between the number of drafts submitted and assignment marks, higher grades being obtained when more drafts were submitted (Whitelock et al., 2014b), thus suggesting that students would benefit from doing more, rather than fewer, drafts. Although the mark RP2 obtained for their assignments is not known, that a student found benefit from doing fewer drafts is interesting. It might be that a minority of students do complete many drafts of an essay, and that the summarisation of an essay provided by OpenEssayist helps such a student in a different manner; in this instance enabling the student to do fewer drafts but maintaining, or improving, their mark. Further research would be required to identify if there is a minority of students for whom OpenEssayist facilitates a reduction in the number of drafts, and the extent to which that might affect marks.

Although not identified within the findings of this research, in previous research (Whitelock et al., 2014b) one student felt that OpenEssayist had changed the way they structured and divided their essay across different sections; though in both research instances the overall number of research participants interviewed was too small to make a statement outside the context of the individual research. However, RP5 who did not use
OpenEssayist, said they used the weighting applied to each element of an assignment to decide how much to write on that topic, thus implying that they consciously divided their time across the various essay sections.

Overall this research found that OpenEssayist facilitated only small changes in how more experienced students planned and wrote their assignments. Additional research is required to establish the extent to which OpenEssayist might have beneficial influence on the way less experienced students plan and write essays, and also the extent to which it helps more experienced students.

4.2.6.4 Essay summary. It was clear from the data that three of the four students who used OpenEssayist felt the essay summarisation feedback, to some extent, helped them to complete their assignments more quickly. For example, RP1 felt that OpenEssayist summarisation kept them ‘on track’ by giving a visual reminder of the words they had used within the essay, commenting that, “[…] I admit when I start an assignment, when I start the TMA I tend to start with a blank sheet of paper on Word, that’s when I’m more likely to deviate, you can type anything you like in there and you don’t know if you’re on track or if you’re not on track, whereas with OpenEssayist it told you if you, it gave you that, that visual indicator that you got the right words you want to use […].” Similarly RP2 felt OpenEssayist helped them spot word repetition within an essay, which saved them time correcting repetitions. RP2 and RP6 said they manually checked their essay to ensure it reflected the marking criteria and pointed out that OpenEssayist’s immediate summaries made this process quicker, thus saving time; RP6 commented that, “to me it was really quite helpful, you can really check back with the assessment criteria, it takes a bit of the work, not going through the whole essay again, and basically highlighting for example, those you actually see what has become of the essay and have it side by side on the screen
RP2 also said that OpenEssayist had “drastically reduced” the number of drafts they did as the feedback enabled them to see immediately where changes were required.

What was not clear from the interview data was what the time saved was used for. Did it allow students to spend additional time on their studies and thereby facilitate additional learning, or did it perhaps steer them towards being strategic learners allowing them to complete their assignment to a satisfactory level more quickly.

Not all students thought that OpenEssayist had saved them time. RP3 said, “For me personally, I would say no, it’s not really necessary [OpenEssayist] because I don’t think it helped me cut down a time for example for writing. I guess I, for me personally I would say no”; though RP3 acknowledged that it had helped them prepare a draft earlier than they might otherwise have done. Thus it might be concluded that while OpenEssayist could facilitate time saving for some students there will be other students who, perhaps due to their higher, or lower, level of essay writing experience, it will not. Whitelock et al. (2016) identified that it is important students are supported to believe they can improve their academic work and pointed out that students often must fit study around other commitments. If OpenEssayist does make essay writing a more efficient process, through which students can demonstrate their knowledge and understanding, then it might assist students to become self-regulated learners. Further research is required to develop an understanding of whether OpenEssayist does facilitate quicker essay completion and what the implications might be for students, such as the extent to which it might develop self-regulated learning or unwittingly encourage them to become strategic learners.

4.2.6.5 Most useful feedback types. The research participants all strongly identified the ‘key words’ and ‘key sentences’ feedback as the most useful types of feedback given by OpenEssayist. RP1 found the key sentences a useful summary of their essay, commenting
that, “content, how has it done that? By picking out the key words, the most used key words that came out as a really good tool, I like that a lot”. RP2 also found it useful to have a list of the key words in their essay and the number of times the words had been used, as this gave them an overview of what they had written in the assignment. RP2 went onto say that they did not find the ‘word cloud’ facility within OpenEssayist, but felt that they would have used that as well. RP3 also preferred the ‘key words’ and liked the interactive nature of the feature, stating, “I think that the groups, organising your key words was the most useful […]”. However they commented they would like to be able to easily compare ‘key words’ from one draft to the next, in a similar way that a rainbow diagram for one draft can be compared with a rainbow diagram for another draft. RP3 was not confident about the choice of ‘key sentences’ identified in their essay. They provided an example of a ‘key sentence’ which, from their perspective, was not a core component of the essay. They thought that if the system identified ‘key sentences’ which students did not regard as key to their argument, confidence in the system might be lowered. RP3 made a useful observation here which may warrant further research. RP6 identified the key words and key sentences as a good way of checking they had met the assignment criteria. The preference students had for use of the key word and key sentence feedback corroborates findings from an early study of OpenEssayist where data on which feedback type students accessed showed they mostly requested use of ‘key words’ and ‘key sentences’ (Whitelock et al., 2015).

Students did comment that they would like a more comprehensive guide to OpenEssayist; for example, RP2 acknowledged that they did not find the word cloud and felt that they would have used it if they had. This might suggest that perhaps the key word and key sentence feedback was the easiest to locate and raises the question of whether in different circumstances, and with more familiarity, students would have preferred different feedback types. It will be useful for future research to note if this preference for the key words and
key sentences continues or whether students who gain a greater familiarity with the system make other choices.

4.2.6.6 Rainbow diagram. The four students who used OpenEssayist variously found the rainbow diagram challenging to understand and use. For instance, RP1 said, “so yeah, I came to a bit of a blank on that, I’m not sure how to interpret that [rainbow diagram]”, and RP6 said they did not understand how to interpret the diagram. When a student understood a diagram they found it challenging to use it to improve their essay. RP2 said, “it kind of says what it needs to say, but I just didn’t really connect with it, it …I could see that what you’re looking for is the colours to be close together rather than spread out, I don’t really know, I honestly don’t understand it, I’m not sure how you can make it clearer to me to be honest, I don’t know”. Thus while RP2 understood the interconnectedness demonstrated through coloured nodes, they did not know how they could use this information to improve their essay. Students had been provided with a written user guide for OpenEssayist which explained the rainbow diagram. However they felt that a more detailed set of instructions, perhaps in the form of a short video showing screenshots of good and less good essays, would have benefited them. For instance, RP2 said, “text, yeah, to be able to see somebody using it and explain how it was used would be better than just text in that case because I just didn’t really understand it”. Furthermore RP3 stated that they were a “bit colour blind” and did not have confidence in their interpretation of the coloured nodes; this identifies a potential accessibility issue for certain users.

Research participants gave the perception that if they had more time to become familiar with the rainbow diagrams they would have a greater understanding of them and be more able to use them to check their assignments. For example, RP1 said, “[…] I was a bit confused I wasn’t sure how it worked so I try not to spend, too much time on that […]”. In previous research Whitelock et al. (2014a) expressed surprise that all research participants
correctly completed exercises designed to test their understanding of the rainbow diagrams; in earlier pilot studies, similarly complex diagrams had not been understood.

Whitelock et al.’s (2014a) research participants had very similar information about the rainbow diagrams to the participants discussed here. However Whitelock et al.’s (2014a) participants had information solely about the rainbow diagrams. The participants discussed here had access to a complete guide to OpenEssayist and their attention was not specifically directed to the rainbow diagram element of that guide. Furthermore, although the participants in Whitelock et al.’s (2014a) research demonstrated understanding of the rainbow diagrams, they were not asked to use that understanding to interpret their own essay and then make improvements. This is a two-stage process and the research participants discussed in this dissertation found various challenges in it. Overall the research suggested a further exploration of student use of the rainbow diagrams is required; which perhaps could be undertaken following a modification of the OpenEssayist user guide in line with the participants’ suggestions.

4.3 Conclusion

This chapter has explained how the research data was collected and thematically analysed using Braun and Clarke’s (2006) six-phase process. The thematic analysis identified six themes. Each theme was discussed within the chapter and examples given of the underlying coded data which supported the emergence of the themes.
Chapter 5 – Key Findings, Implications of Study and Conclusion

5.0 Summary of Aim

The overarching aim of this research was to investigate the extent to which OpenEssayist helped master’s level students with their essays. It explored how the different types of formative feedback from OpenEssayist was used by students when drafting their essays and whether that feedback had an effect on the way students planned and wrote essays. It also considered the extent to which OpenEssayist overall, and new ‘rainbow diagram’ specifically, helped students structure their essays.

5.1 Discussion of Research Questions and Key Findings

The following four sub-sections each discuss one of the research questions in relation to the key findings of the research.

5.1.1 To what extent do the different styles of immediate formative feedback provided by OpenEssayist help students when drafting essays?

Overall, analysis of data from the four students who used OpenEssayist supported the idea that OpenEssayist’s different types of formative feedback helped participants when drafting essays, and that OpenEssayist was useful to them and provided meaningful ‘advice for action’. The summarisation facilitated by the feedback types saved time for three of the four students who used the software and made essay writing quicker. For example, the feedback immediately facilitated a review of essay content which allowed students to assess the extent to which a draft met the criteria set out in assignment guide. Prior to use of OpenEssayist this process was completed manually and took more time.

What did not emerge from the analysis was how students used the time gained; was it spent on additional study or did students, perhaps unwittingly, take a strategic approach to
learning? Furthermore, as master’s level students, the research participants could be considered experienced learners. Whether OpenEssayist might have the same time-saving benefit at undergraduate level is not known.

Whilst overall the types of feedback within OpenEssayist helped students draft their essays, the extent to which the different feedback types individually helped them varied. Students strongly agreed that the ‘key word’ and ‘key sentence’ text feedback was the most useful, allowing them to quickly obtain a summarisation of their writing, facilitating an assessment of the extent to which their essay met the assignment criteria. This is an important finding as it corresponds with the findings of previous research which showed that the ‘key word’ and ‘key sentence’ feedback was the most accessed type within OpenEssayist (Whitelock et al., 2015). Less use was made of the graphics feedback options within the software. For example, one participant said they did not use the ‘key word dispersion plot’. Some participants made use of the ‘word count’ graphics, and one thought that the ‘pie chart’ was perhaps one of the least useful feedback types. Overall most students thought the ‘rainbow diagrams’ to be the least useful feedback type, mainly because they experience some challenges understanding and using them.

One limitation of the research was that data suggested less, or no, use was made of some feedback types. Participants indicated that this was due to a lack of knowledge of what feedback was available; this might be because use of OpenEssayist was not formally integrated into the module. Thus, while overall the different styles of formative feedback helped students when drafting essays, the short research period appears to have resulted in an unequal evaluation of the different types of feedback available.

Stevenson and Phakiti (2014) in their meta-review of AWE identified that automated feedback should augment tutor feedback rather than replace it. They suggested that
research into how AWE could be integrated into teaching practice, and the usefulness of such practice to students, might be a pathway for future AWE research. Thus future research into OpenEssayist might focus on the extent to which, when integrated into a module, the system helps students with their essays.

5.1.2 Does OpenEssayist change the way students plan and write their essays?
The evidence from this research suggested that use of OpenEssayist slightly changed the way some students planned and wrote their essays. Three of the participants planned and drafted their essays as before, though there was an acknowledgement from them that immediate feedback from OpenEssayist made this process more efficient and that they had greater confidence in their writing. One of the participants thought that OpenEssayist had changed the way they planned and wrote an essay. They said that OpenEssayist provided a ‘scaffold’ to create an assignment and that they were now doing more essay drafts. This participant was perhaps the least experienced of the four participants who used OpenEssayist and, although now studying at master’s level, their last period of formal study was some 20 years ago at school. Their observations suggested that OpenEssayist might generate beneficial change in the way less experienced students plan and write essays; however additional research is required explore this possibility further as it is based on the comments of one participant.

Stevenson and Phakiti’s (2014) observed that there is little clarity over whether AWE can lead to improvements in writing proficiency. This view is supported to some extent by Roscoe et al. (2017), who commented that research has found mixed results on the effectiveness of AWE; though in respect of OpenEssayist Whitelock et al. (2014b) did find a correlation between the number of drafts completed and assignment scores. Stevenson and Phakiti’s (2014) and Roscoe et al.’s observations suggested that more research is
required into whether, and how, AWE helps students plan and write their essays, and whether overall this leads to greater writing proficiency.

5.1.3 To what extent does the ‘rainbow diagram’ help students structure essays?

Some participants understood the rainbow diagrams, but were unsure of how to best use them to improve their assignments; others found understanding them a challenge. The evidence from this research suggested that the rainbow diagrams did not help students to structure their essays to any great extent and that more guidance on use of the rainbow diagrams would be helpful; though one student did comment that they realised the rainbow diagram of their essay looked like the example rainbow diagram illustrating a good essay, which made them feel they were ‘on track’. Students need to be able to use feedback and complete the feedback cycle (Price et al., 2010). The data suggested that, in this instant, all four students found it challenging to complete the feedback loop in respect of feedback from the rainbow diagrams.

The research participants gave the perception that in the short period over which the research was conducted, they did not find the time to comprehensively review the OpenEssayist user guide and in particular the element on the rainbow diagrams. This view is to some extent supported by one participant who did not find time to use OpenEssayist and commented “I do have a lot to fit it round, and I have actually found this particular module impossible to keep up with because of other things that are going on [...]”. Another participant said they were “a little bit colour blind” which affected their interpretation of the diagrams. This suggested that research into the accessibility of the rainbow diagrams might be beneficial.

Roscoe et al. (2017) stated that it is important to meet student expectations in respect of AWE and commented that expectations can affect student impressions. Future research on
the rainbow diagrams should address student expectations regarding further guidance on how to interpret the rainbow diagram, as well as evaluating how students use them.

5.1.4 Does OpenEssayist immediate feedback help students structure their essays?
The evidence from this research suggested immediate feedback from OpenEssayist can help students structure their essays, provide confidence that an essay is well structured and that the content is what students intended; though the extent to which the participants used and understood the different types of immediate feedback varied according to their engagement with the feedback types. All four students who used OpenEssayist felt it helped them, to varying degrees, both structure their assignments and review its contents in relation to the assignment instructions. Three of the four students also felt that OpenEssayist gave them confidence that they had correctly structured their assignments and included appropriate content - the one exception was a more experienced student who had a high level of confidence in their writing ability. Overall, in the context of the research, OpenEssayist showed that it can provide meaningful “advice for action” (Whitelock, 2010, p.320).

Roscoe et al. (2017) highlighted the importance of presenting AWE to students in a positive way. This research project has provided data which suggests that OpenEssayist feedback can help students structure their essays, and that it can help address the concerns, pointed out by Schroeder et al. (2008), which tutors have regarding student writing skills.

5.2 Summary of Key Findings
The key findings of this study are:

i. OpenEssayist helped most participants to structure their essay:
RP1 commented that OpenEssayist provided ‘scaffolding’ to develop their ideas further and that prior to using OpenEssayist they did not have a means of knowing whether what they had written was correct. This suggested that the OpenEssayist feedback provided a means through which the participant could reflect on whether their essay structure and content was what they intended. RP3 commented that they were less confident about structuring an essay and suggested that the different forms of OpenEssayist feedback could help students ‘balance’ an essay. Thus by providing feedback across an essay, OpenEssayist enabled participants to reflect on essay structure. The feedback also provided a ‘scaffold’ to enable participants to develop their ideas further.

ii. OpenEssayist helped most participants to more effectively plan and write essays:

RP1 said that they found the key words particularly useful for reviewing essay content and that they had done more drafts of their essay than for previous assignments. They felt the software had helped them write a better essay and hence obtain a higher mark on their first assignment than they expected; thus implying that OpenEssayist had helped them more effectively plan and write their essay. One surprising finding was that RP2 wrote fewer drafts when using OpenEssayist, because the feedback enabled them to go straight to where change was needed. Thus they took less time to write an essay, which meant that OpenEssayist had made the essay writing process more efficient for them.

iii. Most participants found it challenging to understand the rainbow diagram and use it to improve their essays. Participants would like further guidance on these aspects:
All the students who used OpenEssayist found, in different ways, the rainbow diagram challenging to understand and use. For instance, RP1 said, “so yeah, I came to a bit of a blank on that, I’m not sure how to interpret that [rainbow diagram]”. Why research participants found the rainbow diagrams challenging to understand and use was not entirely clear. However, participants did give the impression that if they had more time familiarise themselves with the rainbow diagrams, perhaps though a detailed review of the user guide, they would have a greater understanding of them. For example, RP1 said, “[…] I was a bit confused I wasn’t sure how it worked so I try not to spend, too much time on that […]”.

iv. Overall OpenEssayist can give confidence to participants that their essay is well structured and has the intended content:

RP 6 commented that being able to see the highlighted key words and key sentences gave them confidence that they had covered the topic areas required within the assignment. Indeed, overall the research participants strongly identified the ‘key words’ and ‘key sentences’ as the most useful types of feedback given by OpenEssayist for reviewing their essay content. This is perhaps best summarised by RP2 who commented that OpenEssayist feedback provides an opportunity to review an essay prior to summative submission and make improvements which, by implication, can increase confidence that the essay has the intended structure and also the right content.

5.3 Limitations of Study

A limitation of this study was the small number of participants, which resulted in a limited spread of data; and that data only related to master’s level study. Additionally, OpenEssayist was provided as an optional extra to participants, and not formally embedded
in their module. Students therefore had to find time to familiarise themselves with OpenEssayist in addition to their module studies. Not all OpenEssayist feedback types were accessed by participants and participants were unable to comment on the usefulness of the feedback types they had not used – though participants did provide data on why they had not used them. Moreover, the interview questions were subject to some reflexivity; for example, participants were asked whether OpenEssayist helped them to have more confidence in their ability to structure an essay. Importantly, although the research has suggested that OpenEssayist had helped participants structure their essay assignments, this does not of itself demonstrate that OpenEssayist has improved reflective abilities or the development of a meta-cognitive ability which would allow them to apply the skills of evaluation and correction to other essay texts (Stevenson and Phakiti, 2014).

Stevenson and Phakiti (2014) cited Attali (2004), who excluded 71% of his data set because no re-drafting was undertaken by these participants, and suggested that for over two-thirds of a cohort not to make use of AWE software provided to them raised a question regarding the extent to which AWE software is able to stimulate students to produce essay drafts. Two of the research participants interviewed regarding OpenEssayist had not used it, however when asked why they said respectively that their non-use related to a lack of time and a technical issue with their computer.

The results from this project cannot be generalised outside the context of the research group, but can add to the body of knowledge on OpenEssayist. The questions raised by the research, such as the extent to which use of OpenEssayist might result in a beneficial change in essay planning and writing, can direct future study.
5.4 Implications for Future Study

This research has shown that, in the context of the research participants, OpenEssayist can guide and give confidence to students in respect of the structure and content of their essay. However, to build on the findings, research into OpenEssayist might be conducted across larger student populations, at different levels of HE study and in different faculties. Furthermore, if Open Essayist was integrated into the production of module material, how the immediate summarisation of that material might help the production process could also form an area of research. The following future research could be considered:

- An exploration of the different levels of study, and which subject areas, where OpenEssayist feedback might help students structure and review the content of their assignments, as student needs change with HE level, subject and individual ability.
- An exploration of the extent to which students understand and make use of the rainbow diagrams when embedded within a module. What role might visual feedback have in writing and revising an essay?
- The extent to which OpenEssayist gives confidence to students regarding their essay structure and content, and whether this has implications for self-regulated learning.
- Does OpenEssayist change the way students at different levels of study plan and write their assignments?
- At some HE levels does OpenEssayist make essay writing more efficient and what are the implications of this? To what extent might OpenEssayist unintendingly encourage strategic learning?
- To what extent does further research, across a wider research populate, corroborate that the key word and key sentence feedback is the most used feedback type?
• To what extent does use of OpenEssayist correlate with good grades at different levels of HE studies and in different faculties?

• To what extent might OpenEssayist feedback help OU module developers quickly summarise and review drafts of module material?

5.5 Reflection on Methodology

One limitation of the methodology was a lack of quantitative data on student assessment scores, which occurred as the small number of research participants could not reveal any statistically significant data. It would have been helpful to have quantitative data on essay grades to triangulate participant perceptions of how well OpenEssayist had helped them improve their essay structure, and hence their academic writing.

Braun and Clarke (2006) devised a six-phase framework for thematic analysis which guided the production of codes and themes for this project. At the framework’s core is the multiple review of data, codes and themes, to maximise the opportunity to extract meaning from data. However, subsequent to the analysis, routine reviews of the data whilst writing the dissertation revealed the possibility for other codes, which had they been identified earlier, may have enhanced the analysis. One example is the comment from a participant that, “[…] I think that is the most important that it [OpenEssayist] gives you that opportunity to get feedback making improvement”. This comment was coded ‘confidence’, though a code of ‘improvement’ might have been created and the comment coded to that, along with other observations from participants on essay improvement.

Braun and Clarke’s (2006) methodology does not illustrate the same code being used to support more than one theme, whereas within this research some codes supported two themes. For instance, the code ‘visualisation’ was used to identify the themes of ‘structure
and summary’. This was because the coded data extracts suggested ‘visualisations’ provided both an essay summary and helped improve the essay structure. Fereday and Muir-Cochrane (2006) pointed out that thematic analysis is a form of pattern recognition within the data, which facilitates the emergence of themes; data might therefore support the emergence of more than one pattern or theme.

5.6 Reflection on Possible Wider Implications of AWE

Educators are interested in helping students develop metacognitive skills to enable students to develop their knowledge and achieve better learning outcomes (Koedinger et al, 2009). Indeed, there have been several instructional programmes which have been successful in improving students’ metacognition. For example, White & Frederiksen (1998) developed the Thinker Tools Inquiry Curriculum to help students develop metacognitive process in respect of scientific inquiry. One element of their curriculum was ‘Reflective Assessment’ where students were encouraged to evaluate their own, and other students’, work. A similar rationale was behind the development of OpenEssayist - to encourage students to use OpenEssayist’s immediate feedback to develop reflective practices which, through metacognitive processes such as self-regulation, would support essay writing and develop essay writing skills (Van Labeke et al., 2013). Other AWE systems, such as Criterion, have comparable objectives - to develop students’ metacognitive processes through which students would improve their essay writing (Attali, 2004). Indeed one aim of Criterion is to speed up students’ writing processes (Attali, 2004). This dissertation has demonstrated that, within the limited context of the research, OpenEssayist has some capacity to speed up the essay writing process for students. Koedinger et al (2009) identified accelerating learning within each domain of learning as something which, at that time, they had not demonstrated through their research into intelligent tutoring systems. This raises the question of the extent to which AWE generally can facilitate the development of student metacognition and self-regulation across the domains of learning, and also the extent to
which these processes might be speeded up by AWE. If research into AWE systems demonstrated that they could indeed develop metacognition and self-regulation across different domains of learning, and speed up that development, then AWE might have role to play in, for example, reducing the time over which some degree programmes are completed.

5.7 Conclusion
This chapter has highlighted the findings of the project and indicated the implications of the findings for future research. The findings show that, to varying degrees, the immediate feedback provided by OpenEssayist helped most research participants to structure their essays and had a small impact on the way they planned and wrote an essay. Overall OpenEssayist demonstrated a capacity to give participants some confidence that their essay was well structured, and contained the intended content. However, most participants found the rainbow diagram challenging to understand and use, and made suggestions as to what further guidance they would like to help their understanding; such as short instructional videos containing screen shots.

The project has identified areas for future research. These are quite extensive and range from exploring the different levels of study, and different subject areas, where OpenEssayist feedback might help students structure and review the content of their assignments, to identifying how OpenEssayist feedback might help OU module developers to efficiently summarise and review drafts of module material. Overall, to fully explore the potential pedagogical benefits of OpenEssayist, research will need to be conducted across large student cohorts, in different subject areas and at different levels of HE study.
Overall the research has added to the body of knowledge on OpenEssayist and, through the comments of the research participants, demonstrated the potential that AWE and OpenEssayist has to help students with their essay writing.
References


Appendices

Appendix A – Screen Capture of OpenEssayist Feedback Types

Figure 1 Overview of assignment (can show key words and sentences)

Figure 2 Overview of assignment with key sentences highlighted
However, the rich detail provided also provides much information pertinent to the local history, of the areas from which the case studies are drawn, and occasionally within the book, as with the introduction to Ann Martin Taylor’s family, case studies are cited without a specific link to the ideas the authors are forwarding; both these factors, and the localised nature of the sources, could give the impression that Family Fortunes is a local history.

This essay explores the degree to which Family Fortunes might be regarded as a local history rather than a history of ideas using local case studies. It will consider what is meant by the term “local history,” review the use of case studies within Family Fortunes and assess the extent to which these support the ideas forwarded in the book.

Family Fortunes does use detailed case studies to support the ideas it explores, and the depth and richness of some of the case studies, and their regional focus, might suggest that the authors were writing a local history.

Thus there is a duality in the value of the case studies Family Fortunes uses, while they provide evidence to support the views of the authors, of themselves the case studies also provide insight into local history.

As the authors themselves point out, the family is a crucial analytical concept within Family Fortunes and whilst the family case studies they select help to support their exploration of ideas, they also, as Ann Mary Taylor’s writings detail, give historic detail of how children were raised within specific local areas, thus again evidencing the duality of the case studies’ use.

The essay will conclude that Family Fortunes is not a local history and that the aim of the authors was to explore ideas of gender in respect to the formation of the middle class.

 Indeed Theodore Klotzschek points out that the way case studies are used within Family Fortunes does not fully support the broad assertions the authors make regarding the role of gender in the formation of the middle class.

Many sources cited within Family Fortunes provide an insight into the local history of the communities from which they are taken.

Family Fortunes uses the sources to evidence the concepts and ideas the authors forward, such as the diary of Amy Camps providing an insight into the role of women in middle class society.

Figure 3 Key sentences

Figure 4 Key words and phrases
Figure 5 Groups, organise your key words.

Figure 6 Word cloud
Figure 7 Key word dispersion

Figure 8 Word limit
Figure 9 Word count

Figure 10 Rainbow diagram
Appendix B – Interview Guide

Interview Guide

- Introduce self
- Remind interviewee of the object of the research.
- Remind interviewee that interview is being recorded.
- Remind interviewee that they can terminate the interview at any time should they wish to do so.
- Interview will take 45-60 minutes
- Time / date of interview
- Have you got the Interview Question Guide with you?
- If you refer to the screen shots in the Interview Question Guide, please will you let me know so I can capture that information
- At closure of interview thank student for their time.

Questions:

- What do you understand are the general requirements of an essay?
- How confident are you in your ability to correctly structure an essay?
- How did you plan your essay writing before introduction to OpenEssayist?
- Has OpenEssayist made any changes to the way you plan and write an essay?
  - How has OpenEssayist helped you understand how to write an essay?
  - What has made you understand how to write an essay?
- What are you doing that is different now to what you did before?
- Has OpenEssayist helped you to have more confidence in your ability to structure an essay?
- In the past, did you do drafts of your essays? How many drafts might you do in the past? How many drafts might you do now?
- Have you made mistakes with structuring you past essays? Do you make the same mistakes now?
- In the past, have you made use of feedback received from tutors in respect of your essays?
- What effect has OE had on your learning of module material?
- Did you feel that OE helped you write better essays than you might previously done?
- How do you evaluate the feedback you receive?
• How do you use feedback to make judgements about what to improve in your essay?

• What did you do with feedback you did not like? Did you do something with feedback you did not like? Did you ignore feedback you did not like?

• To what extent did you find the OpenEssayist tools useful in helping you revise the structure of your draft of your essay?

• To what extent did the feedback from the OpenEssayist tools helped you to structure your essay?

• Has the feedback from the OpenEssayist tools helped you to understand how to structure an essay?

• Where there any features of OpenEssayist you did not understand?

• What was the most useful OpenEssayist formative feedback tool and why?

• What was the least useful OpenEssayist formative feedback tool and why

• If you could make a change to the way formative feedback is presented in OpenEssayist what would that change be?

• What training, if any, do you think should be given to students prior to their use of OpenEssayist?

• If you had the opportunity to do so, would you like to receive formative feedback from OpenEssayist on other OU modules? If the answer is yes, why would you like to use OpenEssayist on future modules?

Closing Question: What further comments or observations do you have which might help OpenEssayist to provided effective formative feedback on essay structure?

[.....]

Thank student for taking part in interview.

Ask if they have any questions prior to closure of interview.

OpenEssayist Tools - Interview Topic Areas

Essay Tab Tools
i. Highlight key words
ii. Highlight key sentences
iii. Highlight key words and sentences

• How were the Essay tab tools useful in helping you revise the structure of your draft of your essay?

• How has the feedback from the Essay tab tools helped you to understand how to structure an essay?
- What difficulties did you encounter in using the Essay tab tools?
- Could you use the Essay tab tools the way you wanted to?

**Analysis Tab Tools**

i. Show extracted key words and phrases
ii. Show extracted key sentences (by importance; by text order)
iii. Organise key words

- How were the Analysis tab tools useful in helping you revise the structure of your draft of your essay?
- How has the feedback from the Analysis tab tools helped you to understand how to structure an essay?
- What difficulties did you encounter in using the Analysis tab tools?
- Could you use the Analysis tab tools the way you wanted to?
- How useful did you find the use made of colour within the Analysis tab tools?

**Graphics Tab Tools**

i. Show key word ‘word cloud’
ii. Show key word dispersion plot
iii. Show word count structure chart
iv. Show word limit comparison
v. Show word count comparison
vi. Rainbow diagram

- How were the Graphics tab tools useful in helping you revise the structure of your draft of your essay?
- How has the feedback from the Graphics tab tools helped you to understand how to structure an essay?
- What difficulties did you encounter in using the Graphics tab tools?
- Could you use the Graphics tab tools the way you wanted to?
- How useful was the rainbow diagram tool?
- What training should be given to students to enable them to interpret the rainbow diagrams?
- How useful did you find the use made of colour within the Graphics tab tools?
Appendix C – Introductory Letter to Research Participants

Dear [Insert name]

OpenEssayist – Invitation to Participate in Development Research

OpenEssayist is a new automated immediate formative feedback tool under development to help students with the drafting of essays. It provides visual feedback on essay structure to students through text and graphical displays producing, for instance, a list of key words in the essay and a chart to illustrate essay structure compared with an ideal structure. It is a web application that has been produced as part of a research project in IET called SAFeSEA.

As part of the ongoing research and development of OpenEssayist use of the software is being offered to […] students for the duration of the module. It is anticipated that OpenEssayist will be available from the middle of February 2017. However, it will be available only to registered users, and you will receive an email message about this shortly before that date.

The Open University would like to gain student views on the usefulness and usability of OpenEssayist and the extent to which it helps students learn. To this end the University would like to contact you for a brief discussion about how you used, or did not use, OpenEssayist. It is hoped that you might agree to using OpenEssayist for the draft of your TMA01 and TMA02 and subsequently having a 45-60 minute telephone interview on the usefulness of OpenEssayist with a researcher. The interview will be conducted by Stephen Foster, who is a post graduate research student with the Open University’s Institute of Educational Technology (IET). Stephen will contact you during May 2017, following TMA02, and possibly again towards the end of the module for a follow-up interview.

A 45-60 minute interview represents a commitment of student time to assist with research. In recognition of this, students who are interviewed as part of this research will be offered a […] Amazon voucher. If you would like to volunteer to use OpenEssayist for […], and agree to be contacted for interview, please can I ask you to complete the attached interview consent form and email it to […]

If you have any questions regarding participation in the research please do not hesitate to contact Stephen. Stephen’s research at IET is supervised by Doctor Simon Cross and you may also contact Simon if you have any questions. His email address is: […]

Please note that that the telephone interviews will be recorded and transcribed to facilitate analysis of them. The data collected will be your spoken words and your words may be anonymously directly quoted in material produced subsequent to the research. The information sheet accompanying the letter gives more information on OpenEssayist, and provides a link to a user guide which explains how to access the software; an email with logon credentials will be forwarded in due course.

OpenEssayist uses techniques from computational linguistics to analyse pieces of text, identifying the key parts of an essay (structural elements such as the introduction and conclusion, key words and phrases, key sentences and so on) and summarising them. It offers several interactive visualisations of these summaries, organised in ways that encourage you to reflect on your writing, to discover patterns in your essay structure and to trigger insights into what you might have said – or missed out.
Please note that OpenEssayist does not form part of the […] module materials and is provided in addition to them. You may use it as many times as you like to review drafts of your TMAs, at whatever stage of progress, and to plan your revision and rewriting. By using the system, we hope that it will benefit your writing in various ways.

The members of the research team responsible for OpenEssayist have no involvement with […] or with the marking of your TMAs. Members of the module team and your tutors will not have access to the essay drafts that you submit for analysis or to the results the system produces.

We hope you enjoy studying […] and will make use of the unique opportunity access to OpenEssayist provides.

Yours sincerely

Chris Edwards, […] Module Chair

Stephen Foster, Post Graduate Research Student
Appendix D – Consent Form

Student Interview Consent Form

Analysis of Student Experience of OpenEssayist

If you would like to take part in the research into OpenEssayist and agree to be interviewed as explained in the covering letter and information sheet, please ‘check’ the box. Please also complete the details below and return the form to Stephen Foster at the email address provided.

At any time during the research up to the point at which data are aggregated for analysis, which will be 1st June 2017, you are free to withdraw and to request the destruction of any data that have been gathered from you.

Your participation in the research is additional to […] module activities and participation or non-participation will not affect your access to tutorial support or access to the teaching and learning materials provided in the module.

The results of any research project involving Open University students constitute personal data under the Data Protection Act. They will be kept secure and not released to any third party unless duly authorised or required by law.

☐ I am willing to take part in this research, and I give my permission for the data collected to be used in an anonymous form in any written reports, presentations and published papers relating to this study. My written consent will be sought separately before any identifiable data are used in such dissemination.

Please provide your contact details below so that we can arrange a time and date for this interview:

Contact Telephone No: ________________________________
Contact Email Address: ________________________________

Putting your name on this form and returning it indicates that you understand the purpose of the research, as explained in the covering letter, and accept the conditions for handling the data you provide. In returning the form by email you confirm that you are the person to whom the invitation to participate in the research was sent. Please note that as part of the electronic confirmation process you must return the consent form from the email address to which it was sent; the contact email address which you supplied to The Open University.

Name: ________________________________
Date: ________________________________

Please return completed form to: […]
## Appendix E – Number of Data Items Per Code

<table>
<thead>
<tr>
<th>Coding</th>
<th>Coding - Number of Data Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Awareness</td>
<td>4</td>
</tr>
<tr>
<td>Challenges</td>
<td>8</td>
</tr>
<tr>
<td>Accessibility Rainbow Diagram</td>
<td>1</td>
</tr>
<tr>
<td>Confused Rainbow Diagram</td>
<td>1</td>
</tr>
<tr>
<td>Interpret Rainbow Diagram</td>
<td>1</td>
</tr>
<tr>
<td>Training Ideas</td>
<td>6</td>
</tr>
<tr>
<td>Understanding Rainbow Diagram</td>
<td>6</td>
</tr>
<tr>
<td>Change</td>
<td>2</td>
</tr>
<tr>
<td>Confidence</td>
<td>12</td>
</tr>
<tr>
<td>Criticism</td>
<td>9</td>
</tr>
<tr>
<td>Drafts</td>
<td>14</td>
</tr>
<tr>
<td>Single Document</td>
<td>3</td>
</tr>
<tr>
<td>Feedback</td>
<td>11</td>
</tr>
<tr>
<td>How to Use Feedback</td>
<td>12</td>
</tr>
<tr>
<td>Focus</td>
<td>3</td>
</tr>
<tr>
<td>Hints</td>
<td>5</td>
</tr>
<tr>
<td>Level of Experience</td>
<td>9</td>
</tr>
<tr>
<td>Planning</td>
<td>19</td>
</tr>
<tr>
<td>Reflection</td>
<td>4</td>
</tr>
<tr>
<td>Structure</td>
<td>26</td>
</tr>
<tr>
<td>Mistakes</td>
<td>4</td>
</tr>
<tr>
<td>Time</td>
<td>11</td>
</tr>
<tr>
<td>Feedback type not used</td>
<td>6</td>
</tr>
<tr>
<td>Training</td>
<td>7</td>
</tr>
<tr>
<td>Feedback type useful – No</td>
<td>1</td>
</tr>
<tr>
<td>Feedback type useful – Yes</td>
<td>8</td>
</tr>
<tr>
<td>Key Sentences</td>
<td>8</td>
</tr>
<tr>
<td>Key Sentence Criticism</td>
<td>4</td>
</tr>
<tr>
<td>-----------------------</td>
<td>---</td>
</tr>
<tr>
<td>Key Words</td>
<td>7</td>
</tr>
<tr>
<td>Visualisation</td>
<td>5</td>
</tr>
<tr>
<td>Wants</td>
<td>9</td>
</tr>
</tbody>
</table>