University of Luton

Technical Review of Plagiarism Detection Software Report

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JISC
Joint Information
Systems Committee

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O. Executive Summary

0.1 Context

The focus of this Joint Information Systems Committee (JISC) funded project concentrated on detecting plagiarism in text-based assignments. With the expansion in the use of the Internet for learning and research purposes, concerns have been raised that the opportunity for plagiarism to take place has increased due to the ease in which material can be copied and pasted from the Internet. Similar concerns have been expressed recently by the media over pre-written essays, published on web-sites or available online through paper-mills and essay banks, which enable students to view and download stock essays or purchase custom written works. There are a range of publicly available plagiarism detection software and services and these vary in cost, the functions they perform, the technical specifications and the ways in which they operate.

0.2 Aims and objectives

The main aim of the project was to evaluate the effectiveness of the software and services for detecting various kinds of plagiarism in text-based assignments and compare the performance of the detection tools. Objectives included, firstly identifying the types of plagiarism academics reported encountering, secondly, the range of technical solutions available for detecting these types of plagiarism and thirdly, reviewing the tools available from a technical and user perspective. The report details the activities undertaken by the project team and comprises three main strands of investigation; a user perspective trial, a technical review and a survey of HE and FE academic staff.

The Internet search identified a wide range of commercial products and services available for purchase to detect plagiarism. Plagiarism detection software and services can be broadly banded into two groups, those designed to detect plagiarism in computer programs and those designed for detecting plagiarism in text-based documents. Most of the software reported as developed in-house is of the kind relating to computer programming. In this report we focus on the range of technical solutions for detecting instances of text-based plagiarism as encountered in written discursive assignments.

There are a range of technical solutions available for detecting plagiarism including various software programs and services and these vary in design and perform different functions. Some software programs and services are designed to detect material cut and pasted from the Internet, while others detect instances of identical or very similar submissions. Some services have the facility to compile databases and so build-up a repertoire of assignments and material that has been purchased from paper-mills and essay-banks. In this way a second assignment submitted will be matched against the captured material. Some of the services combine several features and offer solutions for detecting different forms of plagiarism.

0.3 Definitions

In the context of this report the term plagiarism is used in a narrow sense to refer to text documents copied from another source without acknowledgement. The term collusion is used where documents overlap and inter-link with each other to varying extents, indicative of work copied from peers.

0.4 Results

Results from the **user perspective** trial show that most of the software and services were relatively effective at detecting plagiarism. The number of stars allocated to each represents the overall performance of the software and services to perform the functions as listed in table 1.

Key to ratings: Excellent ★★★★★ Good ★★★★ Acceptable ★★★ Poor ★★ Unsatisfactory ★

Products	Function	Detection Performance	Clarity of reports	Value for money per single user	Overall feel/ user friendliness
Turnitin	Cut/paste Paper-mills Collusion	★★★★ ★★★★ ★★★★★	★★★★★	★★★★	★★★★★
Findsame - demonstration version	Cut/paste	N/A	★★★★★	Not Known	★★★★★
Eve2	Cut/paste	★★★★	★★★	★★★★★	★★★★
CopyCatch	Collusion	★★★★★	★★★★★	★★★★★	★★★★★
WordCHECK	Collusion	★	★	★	★

Table 1: Overall results from the user perspective

In contrast to the user perspective, the technical rating is based very much on **how** the structure is installed and delivered, rather than to **what** the structure delivers in terms of validity of results. There is no overall rating given for table 2 because of the difficulty of performing a true technical comparison between products, which have very different functionality and therefore utilise different technologies.

As you can see from the table below, the technical review indicates that a web-based product is more suitable for mass distribution, but will score lower in terms of its reliability due to its reliance on the Internet. For the web-based portal services, only Turnitin is Bobby[1] complaint.

Products	Reliability	Suitability for mass distribution	Pricing per institution	Stability of vendor	Speed of response	Technical support
Turnitin	★★	★★★★★	★★	★★★★	★★	★★
Findsame - demonstration version	★★	★★★★★	★★★★	★★★	★★★	N/A
Eve2	★★★	★★	★★★★	★★★	★★★	★★★★
CopyCatch	★★★★★	★★★	★★★	★	★★★★★	★★★
WordCHECK	★★★★★	★★★	★★★	★★★	★★★★★	★

Table 2: Overall results from the technical review

Results from the **survey** show that plagiarism is considered to be a significant problem. Academics reported that the primary source of plagiarised material was work copied from textbooks and theses. The second most common source was material cut and pasted from the Internet. In addition 21 academics reported in the open questions that students copied from their peers without acknowledgement.

0.5 Conclusions

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[1] Bobby is a tool for the validation of HTML in terms of its accessibility in accordance with WAI (Web-accessibility initiative standards). There are three levels, of which level 1 is the minimal requirement for an accessible web page.   http://www.cast.org/bobby

(1) The review from an academic user perspective confirmed the functions of electronic detection service/software as limited to detecting instances of material cut and pasted from the Internet, instances of collusion and reliance on capture techniques for detecting text books and paper-mill submissions.

(2) The trial of the software/services established that the tools were mainly consistent with their promotional literature and effective in identifying the types of plagiarism that they are designed to detect. However, the trial did uncover some anomalies in the results and not all tools performed to an acceptable Level for all tasks.

(3) The technical review shows that some of the software/services are more robust than others.

(4) The survey identified the main sources of plagiarised material encountered by academics as coming from textbooks and theses. Work cut and pasted from the Internet was ranked second as a source.

(5) The most common trigger that arouses academics' suspicions of plagiarism in assignments is a change of writing style within text and differences in syntactic structure and in the use of terminology.

(6) Most academics do not use any dedicated electronic detection software or services, although most responded that they are aware of electronic detection software/services.

(7) It was noted that there is not a single service or software tool that will detect all sources of plagiarised material encountered by academics. These comprise works derived from electronic discussion boards and those taken from conventional paper based books and theses. (Although, presumably, in time, those using proprietary databases will capture chunks of text copied from sources other than the Internet, when submitted on subsequent occasions by different authors).

0.6 Recommendations - software and services

(1) Trial the ability of Eve2 and CopyCatch, to handle bulk-uploads.

(2) Further trial the effectiveness of Turnitin to detect papers purchased from paper-mills, (especially UK- based) and plagiarised material from textbooks and theses. This further tests the effectiveness of the database service, which is dependent on content previously submitted and therefore critical to success. Database features dependent on content submission may take time and funds to acquire.

0.7 Recommendations for further research

(1) The survey should be extended to include students' perceptions to ascertain if plagiarism is more widespread than academics believe and if the Internet is the most common source of plagiarised material.

(2) Follow up survey through interviews and focus groups to establish why uptake of electronic detection services is poor and examine in more detail methods which academics deploy to identify plagiarism as compared to electronic tools.

(3) A study into aspects of style should be conducted to include an in-depth analysis of linguistic features that are used to determine authenticity of text-based works. The principles should then be extended to develop software, which flags up these features for use in plagiarism detection or for authentication in distance learning courses.

(4)   Undertake a study of the economies of scale of providing a national service, which involves collaboration with publishers and addresses issues of copyright and intellectual property rights.

1. Introduction

This report investigated three main aspects of plagiarism:-

1. An overview of the technical solutions publicly available to overcome plagiarism.

2. (i) A trial of five of the software and services from an academic user perspective, which in the product guides gives results of the performance comparison of the tools, showing the effectiveness of the tools to accomplish specific tasks. (See appendix C for full details.)

    (ii) A technical evaluation of five of the software and services, which details specifications and offers guidance on the suitability of implementing the various detection software or services within an academic environment.

3. An academic survey (Appendix A) to determine the extent and nature of plagiarism as perceived by academics in HE and FE institutions.

The report is organised into the following sections:

Section 0   Executive summary
Section 1   Introduction
Section 2   Product Guides
Section 3   List of products available but not selected for study
Section 4   Overall table of results
Section 5   Appendices

2.   Product Guides

2.1   The products

This report will provide an overview of the five products listed below:

Products	Companies
Findsame	Digital integrity
Eve2	CaNexus
Turnitin	iParadigms
CopyCatch	CFL Software Developments
WordCHECK	WordCHECKsystems

2.2 An explanation of the Product Guides

This section contains a brief description and review of each of the five products. Each product guide will comprise the following:-

Company Background

This section provides a short description of the company, including their main interests and activities. It lists the product range available from the supplier and gives details of the software available for detecting plagiarism in academic environments.

User perspective - Practical use by academic

Within this section, the software and services have been tested from the perspective of an individual academic using the tools for the first time to detect different kinds of plagiarism, commonly found in some student's work. Of prime importance to the academic is the performance of the tools and their effectiveness in detecting plagiarism and in generating timely reports that are accurate and easy to interpret.

Material was created to simulate examples of assignments containing material cut and pasted from the Internet, copied from peers (indicating collusion) and papers from essay banks and used to test each product over a period of time.

The academic user review was conducted using the following four evaluation categories:

Detection performance

To test the reliability of results eleven documents, drawn form six academic disciplines, were produced and grouped into four categories according to the type of plagiarised material included. The eleven essays were tested a total of 116 times over a period of three months. The Web is a dynamic environment and results therefore varied slightly over the testing period. Over a three-month period eleven essays were submitted periodically to all the software and services reviewed. Those that searched the Internet returned inconsistent results for the same plagiarised material depending on when they were submitted.

Appendix C gives full details of the performance results gained for each product. All the tests were performed on the same desktop PC (Windows 95 platform) equipped with a reliable and fast Internet connection. (See Appendices C and D for further information.)

Clarity of reports

The search result reports were examined for accuracy, clarity of coding, and for the contribution report layout and structure made to the ease and speed of interpretation of results. (See Appendix B.)

Value for money per single user

The services were evaluated from the perspective of an academic user looking to implement a reasonably priced, user-friendly system of plagiarism detection for small-scale use within a single department of an institution. A web-based annual subscription service was therefore scored lower than services obtainable for a one-off payment.

Feel/friendliness

A subjective, personal overall 'feel-good' appraisal of the services from the perspective of a reasonably computer literate academic user with no specialised technical skills.

Technical Review

The technical solutions range from standalone solutions that index and examine documents on a local workstation, through to entirely web-based solutions that search Internet databases of content. Products and services also exist as a mixture between these two implementation types.

The software and systems can be divided into two categories in terms of their functionality. They therefore utilise different types of technologies making true technical comparisons between all products difficult to perform. Software intended to detect collusion uses computer programs that seek linguistic similarities between text documents. Software and systems that detect material cut and pasted from the Internet use web technologies similar to search engines. While most of the products either detect collusion or cut and paste, one has dual functionality.

Within this section, the software and systems have been looked at from a technical standpoint and commented on in generic terms, as far as possible. Please note that no reference is made here to the quality of the results of the products, or indeed the validity of the results and their scope - this information can be found in the user perspective section.

The technical review was conducted using a series of six evaluation categories:

Reliability

In terms of service reliability, web-based portals are less reliable as they depend on an unknown quantity of links, work across multiple networks and the up-time of globally distributed servers. Therefore their stability is an unknown quantity. Products that run locally (either on individual PC's or local servers) are easier to backup and reinstall and thus they have scored higher in terms of reliability.

The reliability of the service has a direct impact on the reliability of the results. This is reflected in the inconsistency of results achieved in the academic user review. (See Detection Performance above and Appendices C and D.)

Pricing

When considering pricing, annual cost and initially outlay has been considered for an average sized institution and a generalist approach has been taken with regard to the normal prices for specific task software. These products are expected to cost more than generalist applications like word processors and spreadsheets, but they tend to be 'worth' less in terms of production

(when considering the amount of work it takes to produce them, rather than say CAD or GIS packages).

The rankings made are a view from the author, when considering the implementation methods and technologies, value for money (in comparison with other software types) and the actual licensing costs for use on a wider scale.

Mass distributable

Cross platform installations are preferable, as they provide access to a larger community, and thus web-based installations will score higher marks. The next lowest score is given if the software is available for only one platform and is networkable within an institution. The lowest score will be received by a standalone product (used on a single workstation), that is unable to be networked.

Turnaround speed

If many items are to be examined for plagiarism, turnaround speed can be vital when choosing a package, especially considering that extensive use can be seasonal, for example, during project/assignment submission time at the end of an academic year. It is assumed that the Internet connection within most academic institutions is reliable and has high bandwidth capacity. Those products that are installed locally, and work on local databases will score a higher mark as processing will be much quicker, whereas those that rely on an Internet connection may score less if the processing is done by a service provider or Internet connected database.

Technical support

Speed of response of technical support can sometimes be critical if problems are encountered. Only email support was tested at this time, as this seems to be the most common way technical staff communicate with supplier companies. It enables a thoughtful approach to problem resolution and proof of flow of problem resolution.

Concise and relevant answers were also considered, and they will score more highly also.

Stability of Vendor

When considering stability of vendor, an overall impression has been gained from support offered, professional web-site design, and the authors' industry experience of vendors. A vendor is considered to be 'unstable' if there appears to be less professionalism in the way they conduct their business. If an institution is to pay for support and a product, it is important that the company remains operational and can respond quickly to support requests and provide bug fixes during the products working life.

2.4 Digital Integrity
http://www.digital-integrity.com

Company Background

This is a brief summary of the information accessed from the web-site (28/3/01). The information is no longer displayed. (6/7/01).

The company was founded in 1998 in San Mateo, California. Their activities include developing software for tracking and controlling the flow of electronic information. The products are mainly aimed at the corporate sector with the exception of Findsame. The Chairman is active in supporting educational technologies for learning centres and research at Stanford University and the University of California, Berkeley. Interestingly, Dr Aiken, the Chief Scientist and Co-founder of the company is the software developer of MOSS, the system for detecting plagiarism in computer programs.

Products Available

This company has developed a range of products that detect or track documents, but are mainly targeted at the commercial sector. Products developed include:

DI Tracker [sm] - Compares the reach of announcements and reports copyright content hijack on the Internet.
DI Watcher [sm] - Locates and tracks articles, showing distribution of articles on the Internet
DI Inspector[sm] - Monitors information on corporate networks. Detects information that has been released by an employee to an agent and tracks down modified documents.

The company operates a secondary service with an academic focus. This is located at:

findsame.com - http://www.findsame.com

Designed to detect material cut and pasted from the Internet. A service provided by Digital Integrity (DI)and based on MOSS technology. It seems more geared towards the needs of the academic community, rather than the other DI products, but does not appear in the DI product listing.

User Perspective – Practical use by academic

Initially Digital Integrity Inc expressed an interest in taking part in this trial but failed to respond to subsequent emails requesting access to a fully working version of the service. The free 'Findsame' demonstration version offers a selection of essays, which can be tested on a set of out of date web sites. Submitting your own texts does not generate valid results for performing a comparison. However, the impression formed by the demonstration indicates that it is an effective and quick service and if the full version can be obtained it might well prove fruitful.

	Star Rating
Function	Cut/Paste
Detection Performance	N/A
Clarity of reports	★★★★★
Value for money per single user	N/A
Feel/friendliness	★★★★★
Overall Rating	**2.5**

Technical Review

Due to the single portal access, Findsame scores low on reliability, but more highly on pricing, as it is more cost effective than competitors for wide scale usage. Turnaround speed of

results is quicker than the other portal systems considered, and thus it scores marginally higher, though the vendor seems to be slightly less professional.

	Star Rating
Reliability	★★
Pricing	★★★★
Mass distributable	★★★★★
Speed of response	★★★
Technical support	N/A*
Stability of vendor	★★★
Overall rating	**3.3**

* For the purpose of ranking an average of 3 stars is assumed.

Summary of Product

- Findsame is a web-based content search tool
- Detects material cut and pasted from the Internet
- Operates with browser and Internet connection
- Performance not trialled on full version
- Reports generated instantly
- Low technical reliability due to single-portal access
- Very easy to mass-distribute
- Good cost effective pricing
- Vendor stability suspect

2.5 CaNexus
http://www.CaNexus.com

Company Background

There is no company background displayed on the web site. An e-mail requesting information has been sent 5/7/01.

Products Available

Essay Verification Engine – EVE2

Designed to detect material cut and pasted from the Internet. EVE2 is a search engine that performs complex searches to find material from the Internet. It does not compile material into a database and so cannot directly compare texts.

User Perspective – Practical use by academic

EVE2 detects material copied from the Internet. It does not compare documents to one another and does not use a proprietary database. It does not trace essays to essay banks or paper-mills. EVE2 does not trace documents that are not in html format. Therefore it will not trace material copied from discussion boards. EVE2 is available to download for a free 15-day trial of the full software program.

EVE2 performed well in detecting work copied from the Internet and the overall feel inspires confidence, as searches are performed from the users' machine, running in the background to other applications. The intensity of searches are controlled by the user and reports are generated on completion of the search (approximately 20 minutes - dependent upon intensity level set).

	Star Rating
Function	Cut Paste
Detection Performance	★★★★
Clarity of reports	★★★
Value for money per single user	★★★★★
Feel/friendliness	★★★★
Overall rating	**4.0**

Technical Review

Whilst EVE2 is a compiled piece of software that runs on a PC, it is an interface that searches the web. It scores highly in terms of service reliability due to its non-reliance on single off-site web databases. If certain aspects of the Internet or certain search engines cease to function, it will still yield some results, though they will not be exhaustible. That said, the product is not easily distributed as it cannot be easily installed for multiple users via a network server. Speed of produced results is good, though its performance would be affected by Internet access speed and Internet traffic at the time it is used.

	Star Rating
Reliability	★★★
Pricing	★★★★
Mass distributable	★★
Speed of response	★★★
Technical support	★★★★
Stability of vendor	★★★
Overall rating	**3.2**

Summary of Product

- A tool that content searches the Internet
- Detects material cut and pasted from the Internet
- Downloads onto user's machine
- Operates on PC (Windows) only, cannot be installed on network for multiple users
- Performance on academic user trial was good. Good value for money for wide scale use
- Prompt and accurate technical support
- Not so easy to rollout on a wide scale

iParadigms
http://www.iParadigms.com

Company Background

The main interests of iParadigms are in the field of digital information tracking. They have dEveloped a suite of tracking tools to combat 'piracy of intellectual property' and display a commercial and academic interest through their three web-sites listed below:

Products Available

(i)   **plagiarism.org -** http://www.plagiarism.org

This was the first site developed to monitor the growth of Internet plagiarism on the UC Berkeley campus. It is now used purely as a discussion and information site.

(ii)   **slysearch** - http://www.slysearch

This site has a commercial focus and deals with products for detecting intellectual copyright in the areas of music, film and video and computer software.

(ii)   **Turnitin -** http://www.turnitin.com

Designed to detect material cut and pasted from the Internet and capture material in a database. It is a **service** offered to the academic community for detecting plagiarism in text-based assignments.

User Perspective – Practical use by academic

Turnitin is a web-based subscription service, which offers simultaneous Internet plagiarism and collusion detection. Turnitin detects material copied from the Internet as well as collusion between students through cross-checking of submitted essays against one another and against an in-house database of texts. When an essay is submitted for checking it is added to the database for future reference. Turnitin can trace essays to papermills but not material copied from discussion boards unless uploads separately. A free restricted trial account is available which allows submission of five manuscripts over a period of 30 days. The trial account does not give access to the Turnitin database. Through the JISC we arranged access to the in-house database being used for the UK trial and conducted a separate trial on essays written in collaboration.

Function	Star Rating
	Cut Paste Paper mills Collusion
Detection Performance	★★★★
Clarity of reports	★★★★★
Value for money per single user	★★★★
Feel/friendliness	★★★★★
Overall rating	**4.5**

Technical Reveiw

Turnitin is an Internet portal, and therefore is a single point (and off-site) remote method of operation and thus it has scored low in terms of reliability, but highly in terms of mass distribution. While easy to access for large numbers, should their web site be off-line there is no alternative method of using the service. The response speed has been marked low, as it is

less quick than other products. They have also scored low on technical support due to their delayed response times, but high on vendor stability due to their reputation in the field.

	Star Rating
Reliability	★★
Pricing	★★
Mass distributable	★★★★★
Speed of response	★★
Technical support	★★
Stability of vendor	★★★★
Overall rating	**2.8**

Summary of Product

- Web-based subscription service
- Detects material cut and pasted from Internet
- Captures material shared between users and integrates into database
- Captures papers bought from paper-mills and integrates into database
- User uploads files
- Report is generated by Turnitin (turnaround usually overnight) and sent to user
- Low technical reliability due to single-portal web access
- Very easy to mass-distribute
- Poor technical support responses
- High price outlay for mass uptake of their service

2.6 CFL Software Development
http://www.CopyCatch.freeserve.co.uk

Company Background

CopyCatch is a product developed by David Woolls of CFL Software Development, which has two main areas of activity: consultancy and software development for forensic linguistics and educational software.

CopyCatch is the diagnostic element of a set of forensic text analysis tools, Vocalyse Toolkit, developed in association with members of the Corpus Forensic Linguist group at the University of Birmingham. The full toolkit includes Abridge, an automatic abridgement program and two detailed text file analysis and comparison components. This is mainly used in the consultancy area of the business.

Multiconcord, used by translators and language teachers and students, is the lead product of the educational software, which also includes a number of programs used in the area of teaching or studying English as a second language.

Products Available

CopyCatch

Designed to compare textual data across multiple submissions of assignments. This program profiles a textual corpus. It checks word frequencies and produces a number count of types (word groups, such as the number of instances of 'the' or 'and' etc) as against the tokens (Every word used in the corpus). The program then reports on the overlap of similarity between one assignment and another.

User Perspective – Practical use by academic

CopyCatch detects collusion between students by comparing submitted documents and calculating the proportion of words held in common. Comparison at phrase level is also possible. CopyCatch does not detect plagiarism from the Internet. The software can be bought direct from the program's author, David Woolls. There is no free demo available. For this trial Mr Woolls kindly made the software available free of charge.

	Star Rating
Function	Collusion
Detection Performance	★★★★★
Clarity of reports	★★★★★
Value for money per single user	★★★★★
Feel/friendliness	★★★★★
Overall rating	**5.0**

Technical Review

CopyCatch is a standalone product that does not require web access, and therefore its service can be considered very reliable. Whilst its pricing is a little expensive, it can be mass distributed easily, and gives instant results. The downside is that the product's vendor is a sole trader and therefore does not have the stability and backup that could be provided by a larger company. The look and feel of the program is more 'home grown' than professional. However the product does not rely on access to external materials and therefore vendor stability, depending on level of use, may not be as important as with other products.

	Star Rating
Reliability	★★★★★
Pricing	★★★
Mass distributable	★★★
Speed of response	★★★★★
Technical support	★★★
Stability of vendor	★
Overall rating	**3.3**

Summary of Product

- A program that content searches uploaded Word documents
- Detects material shared between users
- Downloads onto users machine
- Operates on PC (Windows)
- Can be installed on network for multiple users
- Performance on academic user trial was excellent
- Fast, quick results, though reliant on local content only
- Instant results can be obtained
- Low image and less professional look of vendor
- Average level of technical support

2.7 WordCHECK Systems
http://www.WordCHECKsystems.com

Company Background

WordCHECK keyword software is a product of WordCHECK Systems, Lincoln, Nebraska. There is no further information about the company displayed on their web site, 6/7/01.

Products Available

WordCHECK

Designed to compare textual data across assignments. This program checks keyword uses and keyword frequencies in electronic documents and presents a percentage of match, between compared data, signaling plagiarism.

User Perspective – Practical use by academic

 WordCHECK detects collusion between students by matching key word profiles between a submitted document and documents held in an internal archive. It does not detect plagiarism from the Internet. WordCHECK does not allow profile matching at phrase level. A profile matching add on to WordCHECK can be bought for $149. WordCHECK version 2, which is presently under development, will incorporate profile matching at both word and phrase level. WordCHECK software is available to download for a free trial of 30 days. The demo is fully operational but the internal archive has been restricted to holding only four documents at any one time.

	Star Rating
Function	Collusion
Detection performance	★
Clarity of reports	★
Value for money per single user	★
Feel/friendliness	★
Overall rating	1.0

Technical Review

WordCHECK is a standalone product that does not require web access, and therefore its service can be considered reliable. The turnaround of results for WordCHECK is quick, but less quick than CopyCatch. It is relatively easy to mass distribute, but technical support from the authors was considered poor. Pricing as compared to other products is generally as cost effective.

	Star Rating
Reliability	★★★★★
Pricing	★★★
Mass distributable	★★★
Speed of response	★★★★★
Technical support	★
Stability of vendor	★★★
Overall rating	**3.3**

Summary of Product

- A program that content searches uploaded Word documents
- Detects material shared between users
- Download the program onto the users machine

- Operates on PC (Windows) only
- Cannot be installed on network for multiple users
- Performance on academic user trial was poor
- Fast, fairly quick results, though reliant on local content only
- Poor technical support response
- Pricing for wide scale usage considered average

3. Products not selected for this study

IntegriGuard
http://www.integriguard.com

Provides two **services** for detecting plagiarism.

PaperBin.com
http://paperbin.com
Compiles a database and checks documents against it

Howoriginal
http://www.howoriginal.com
Is a free service allowing a small proportion of text (1000 characters) to be entered and a report is generated and e-mailed to user.

We did consider using Integriguard, but this was under development at the time of our trials and only a small Internet plagiarism detection service was operational. This service allows the submission of 1000 characters, about one paragraph of text. Initial testing showed that this was not enough to produce a valid comparative study. Therefore IntegriGuard was excluded from the study.

CFL Software Development

Provide a range of software including, Vocalyse Toolkit; other products include: Abridge, Analyser and File Comparison.

Products and services reported in the academic staff survey (Appendix A) as used or trialled include:

CopyCatch

Findsame

Glatt (www.plagiarism.com software that uses a cloze procedure technique)

Plagiarism.com (Glatt)

How.orginal (Integriguard)

Plagiarism.org (Turnitin)

Sherlock (Computing programs)

Ceilidh (www.cs.nott.ac.uk/~ceilidh
Developed at Nottingham University as a courseware system for use in Computing programs)
CourseMaster (The new version of Ceilidh)

In addition another program was reported to us - **Ferret** developed by the University of Hertfordshire.

4. Overall table of tools

Excellent ★★★★★ Good ★★★★ Acceptable ★★★ Poor ★★ Unsatisfactory ★

		Findsame	Eve2	Turnitin	CopyCatch	WordCHECK1
Company	Company	Digital Integrity	CaNexus	iParadigms	CFL Software Development	WordCHECKsystems
	URL	http://www.findsame.com	http://www.CaNexus.com	http://www.turnitin.com	http://www.CopyCatch.freeserve.co.uk	http://www.WordCHECKsystems.com
Delivery Method	Type of system	Web content search system	Compiled local executable, that content searches the Internet	Web-based content search system (of user uploaded files and Internet content)	Compiled local content searcher	Compiled local content searcher
Price	Cost for universities	Free demo	$399 per institution (multi-site), or $19.99 per user	Site license $4000 per annum for unlimited reports	£2000 per institution one-off (negotiable) (upgrades extra)	Basic package for single user is $95 (academic price). This archives 1000 documents. Additional units are then charged 2,000 units @ $295 5,000 units @ $895 10,000 units @ $1,495
	Cost for one user	No information	$19.99 one off payment	One year subscription is $100	One off payment of £250	One off payment of $95
Technical	Operating environment	Web-based	PC (Windows only)	Web-based	PC (Windows only)	PC (Windows only)
	Ease of mass distribution	Requires browser and Internet connection	Cannot be installed on network for multiple users	Requires browser and Internet connection	Can be installed on network for multiple users	Can be installed on network for multiple users
	Turnaround speed	Instant, dependant on server up-time and Internet traffic	Instant, but local, dependant on processor speed and Internet traffic	24 Hrs	Instant, dependant on processor speed	Instant dependant on processor speed
	Installation engine	N/A	Reliable installer engine	N/A	No installation routine, a manual file transfer	Reliable installer engine
	Reliability	★★	★★★	★★	★★★★★	★★★★★
	Suitability for mass distribution	★★★★★	★★	★★★★★	★★★	★★★
	Stability of vendor	★★★	★★★	★★★★	★	★★★
	Speed of response	★★★	★★★	★★★★	★★★★★	★★★★★

Technical support	N/A	★★★★	★★	★★★	★

Overall table of tools (continued)

Excellent ★★★★★ Good ★★★★ Acceptable ★★★ Poor ★★ Unsatisfactory ★

		Findsome	Eve2	Turnitin	CopyCatch	WordCHECK
Academic User	Function	Cut/paste	Cut/paste	Cut/paste, papermills and collusion	Collusion	Collusion
	Detection performance	N/A	★★★★	Cut/paste ★★★★ Papermills ★★★★ Collusion ★★★★★	★★★★★	★
	Clarity of reports	★★★★★	★★★	★★★★★	★★★★★	★
	Overall feel/user friendliness	★★★★★	★★★★	★★★★★	★★★★★	★
	Detection at level	Phrase/ sentence	Phrase/ sentence	Phrase/ sentence	Word/ phrase	Word
	Obtaining the tool	Web-based service	Downloadable	Web-based service, password	Software zip file emailed from author	Downloadable
	Clarity of instruction and support materials	Easy to follow step by step instructions	Easy to follow step by step instructions	Easy to follow step by step instructions	Easy to follow step by step instructions	Easy to follow step by step instructions
	Submitting documents	Copy and paste and file submission. No batch submission	File submission. Small batch submission	Copy and paste. No bulk and file submission. Slow. In full service student submission is available	File submission. Batch submission	File submission No bulk submission
	Can results be printed?	Yes (best in colour)	Yes	Yes (best in colour)	Yes	Yes
	Accuracy of detection	N/A (not a full demo)	★★★★	Cut/paste ★★★★ Collusion ★★★★★	★★★★★	★
	Layout of reports	★★★★★	★★★★	★★★★★	★★★★★	★
	Are results easy to interpret?	Colour coding on matching web-sites ★★★★	No colour coding on matching web-site ★★★	Colour coding on matching web-sites ★★★★	Yes, colour coding of lexical and function words and numbering of phrases ★★★★	No, the report is not informative ★
	Accuracy of results	N/A Full test not performed	Did not trace 100%. Did not trace paper-mill essays ★★★	Did not trace 100% Traced some paper-mill essays ★★★★	Yes 100% accurate ★★★★★	No. The detection results are not reliable ★

Table 3. Overall table of tools

5. Appendices

A: Academic staff survey findings

             (i) Online questionnaire

B: Academic user evaluation showing ease of use and clarity of information supplied

C: Performance results of tools to detect plagiarised material

D: Descriptions of the essays used in the trial

E: Details of project team members

F: Disclaimer

Appendix A

Academic staff survey findings

Methodology

Initially, a literature search was conducted to gain an overview of the general issues associated with plagiarism. A web-site search was conducted to determine the range of electronic solutions publicly available for detecting various forms of plagiarism. A further web search of essay banks and paper-mills was conducted to assess the availability of essays and ease of acquiring them from web-site sources. Two papers on the theme of technology and education were purchased for use in the trials.

Survey

A qualitative survey, involving academics in HE and FE institutions was undertaken to gather perceptions, opinions, views and experiences of issues relating to the scale of plagiarism, linguistic features that signal plagiarism and the extent of usage and knowledge of detection software and services. Academics were also asked to inform us about in-house software they have developed, used, or trialled.

The survey gathered a mixture of demographic and closed type data. It included an open-ended section to allow for elaboration of answers. The questionnaire was designed in three sections to cover the relevant issues, identified as a result of the literature search. It therefore acted as a preliminary probe into the scale of the problem, linguistic features which arouse suspicions of plagiarism, the usage of electronic means of detecting plagiarism in academia and issues relating to policy.

In order to reach a wide section of the academic community and to facilitate a fast response rate the survey was distributed online. Coverage of HE was via JISCMAIL and the CAA Centre's national network of contacts and distribution lists, which include a range of HE institutions. FE coverage was via key individual contacts in various FE related institutions and colleges. In an attempt to gain wider FE coverage the questionnaire was further distributed using JISC Colleges UK mail-base and displayed online on the National Information and Learning Technologies (NILTA) web-site.

Software and services

Five different plagiarism detection software and services were selected from the range of technical solutions identified and publicly available. The ones selected included those mentioned by respondents in the survey. Of the in-house developed software these mainly pertained to detecting plagiarism in computing programs.

Using the five identified products and services a technical review was undertaken. They were 'put on trial' from an academic user perspective and evaluated from a technical perspective for their potential for successful implementation in academic institutions. The products and services include:

Company name	Digital Integrity	CaNexus	iParadigms	CFL Software Development	WordCHECK Systems
Web-site address	http://www.findsame.com	http://www.CaNexus.com	http://www.iParadigms.com	http://www.CopyCatch.freeserve.co.uk	http://www.WordCHECKsystems.com
Product	Findsame	EVE2 (Essay Verification Engine)	Turnitin http://www.turnitin.com	CopyCatch	WordCHECK

Table 4: Details of the software and services selected for the trial

To trial the software a range of authentic material was created to simulate instances of plagiarism in academic assignments. Material was cut and pasted from the Internet, original essays were written by members of staff and altered by another member to represent instances of collusion. Two papers were purchased from paper-mills, one from a US paper site and the other from an English essay bank site.

Survey results

In total 321 online questionnaires were submitted to the CAA Centre and of these 293 respondents were from the HE sector, 26 from FE and 2 respondents selected Other.   A copy of the questionnaire is provided online see Appendix B.

A breakdown of results is given and expressed as percentages of the total number of respondents answering each question.

In part one of the questionnaire, respondents were asked to indicate their perceptions of the scale of plagiarism and respond to the statement, "Plagiarism is a significant problem in academic institutions". The results are shown below in Figure 1.
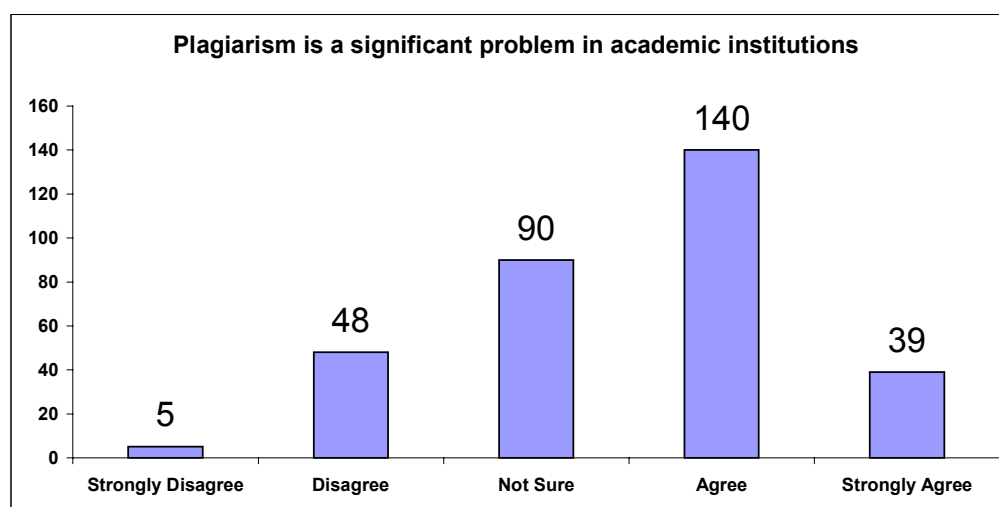

Figure 1: Breakdown of responses indicating scale of the problem as perceived by academics

The second statement asked respondents to indicate the level of plagiarism in their institution on a Likert scale and the responses were as follows:

Not at all	Rarely	Not often	Often	Very often
0.8%	18.9%	40.6%	35%	4.7%

Table 5: Breakdown of responses to occurrences of plagiarism

- To the question, "Do you consider there has been an increase in plagiarism in recent years?" 50% of the respondents believed that there had been an increase, 35% answered don't know and 15%, replied no.

- To the question, "Is plagiarism harder to detect if it has been acquired from the Internet rather than from traditional resources?", 42% of respondents replied yes, 35% no and 23% replied don't know.

- Respondents were asked to indicate the features that made them suspicious of students' work and the results are shown as percentages of the total number of respondents.

Features	Percentage of respondents (n=321)
Terminology	67%
Sentence structure (syntax)	67%
Change of writing style within the text	72%
Written work different from that produced in class	32%
Writing style above or below students' skill level	63%
Differences in formatting throughout work	28%
Feeling of familiarity with the text	66%

Table 6: Breakdown of features identified by academics as indicative of plagiarism

Respondents were asked to indicate if they had Ever identified work as having come from the sources as shown listed below together with the results.

Source	Percentage of respondents (n=321)
Cut and pasted from the Internet	42%
Copied from CD ROM	7%
Electronic discussion boards	6%
Shared computers	12%
Another course	18%
Text books/theses	74%

Table 7: Breakdown of results showing sources of plagiarism.

Academics were asked to indicate if they had ever reported students for cheating and 64% of the respondents answered yes and 36% answered no (n=314). Some respondents elaborated on their answers by using free-text.

Following this question academics were asked to indicate whether their conduct over instances of plagiarism had Ever been called into question and the results are as follows: 94% answered No and 6% answered Yes (n=314).

- Part two of the questionnaire focussed on electronic plagiarism detection software and services. The first question asked whether or not academics used any detection software and only 4% answered yes and 96% no (n=302). Of the 4% these were mainly staff involved in the trials of the software or staff developers. Following this respondents were asked to indicate if they intended to use electronic software or services in the future and 12% answered yes, 16% no and 71% maybe (n=314).

- A probe into strategies taken by academics to uncover instances of plagiarism was undertaken. To the question, "Do you check students' work against web-sites that contain relevant information?", 47% replied never, 49% replied occasionally and 4% replied often. Academics were asked if they used search engines to find work that they suspected was plagiarised and 59% replied never, 37% occasionally and 4% often. Related to this was the question, "Do you perform searches using keywords?" and 62% replied never, 34% replied occasionally and 4% replied often. Academics were then asked if they had ever searched the Internet using a unique phrase from a student's work. The replies were, 78% no and 22% yes.

- Part three concentrated on matters relating to policy and to the question, "Does your institution have a policy on plagiarism?", 88% answered yes, 2% answered no and 10% answered don't know (n=313). The other question asked in this section was: "Are student's required to sign a pledge or ethics statement?" Of the respondents, 50% answered yes, 23% answered don't know (n=307).

Summary

Results from the survey show that plagiarism is considered a significant problem in academic institutions and there are different types of plagiarism. The most common source of plagiarism is textbooks and theses followed by material cut and pasted from the Internet. Comments made in the survey suggest another common source of plagiarism encountered is from assignments shared or copied from fellow students. Material purchased from paper-mills or essay banks publicly available on the Internet was less often reported as a problem, but maybe this is an area that has not yet been fully realised or identified by academics.

Results from the survey indicate academics suspect work is not the students' own for a number of reasons, of which changes in writing style within the text is the most common. Results also indicate that the uptake of e-detection software and services is low, but products or services used or trialled have been identified and included in section 2, together with in-house software programs developed by individuals or academics.

The inclusion of the free text section generated a number of responses about the nature and possible causes of the plagiarism encountered by academics. In this box respondents offered views and opinions on how best to tackle the problem of plagiarism.

Appendix A (i)

Online survey:
http://caacentre.ac.uk/plagiarism/form

Appendix B

Academic user evaluation showing ease of use and clarity of information supplied

> **Key: Excellent ★★ ★★★ Good ★★★★ Acceptable ★★★ Poor ★★ Unsatisfactory ★**
> **Shaded area = collusion detection**

| Name | Copy and Paste | | | Collusion | | |
	EVE2.3	Find same	Turnitin		Copy Catch	Word CHECK
Price for one user	$19:99 one off payment	No information	One year $100 (web +	Subscription Collusion)	£250 A one off payment	$95 A one off payment
Detection at level of:	phrase/ sentence	phrase/ sentence	phrase/ sentence	phrase/ sentence	word/ phrase	word
Obtaining the tool	Down-loadable software	Web-based service.	Web-based service. Pass word	Web-based service. Pass word	Software zip file emailed from author.	Down loadable software
Clarity of instruction and support materials	Easy to follow step by step instructions ★★★★★	Easy to follow step by step instructions ★★★★★	Easy to follow step by step instructions ★★★★★	Easy to follow step by step instructions ★★★★★	Easy to follow step by step instructions ★★★★★	Easy to follow step by step instructions ★★★★★
Submitting documents	File submission. Small batch submission. ★★★★	Copy and paste and file submission. No batch submission. ★★★★	Copy and paste. No bulk and file submission. Slow. In full service Student submission is available ★★★★	Copy and paste. No bulk and file submission. Slow. In full service Student submission is available ★★★★	File submission. Batch submission ★★★★★	File submission. No bulk submission ★★★★
Can results be printed?	yes	yes (best in colour)	yes (best in colour)	yes (best in colour)	yes	yes
Accuracy of detection	★★★★	N/A (Not a full demo)	★★★★	★★★★★	★★★★★	★
Layout of report	★★★★	★★★★★	★★★★★	★★★★★	★★★★★	★
Are results easy to interpret?	No colour coding on matching web-sites ★★★	Colour coding on matching web-sites ★★★★★	Colour coding on matching web-sites ★★★★★	Colour coding on matching web-sites. ★★★★★	Yes, colour coding of lexical and function words and numbering of phrases ★★★★★	No, the report is not informative ★
Are results accurate?	Did not trace 100% of copied material. Did not trace paper-mill essays ★★★	N/A. Full test not perfor med.	Did not trace 100% of copied material. Traced some paper-mill essays ★★★★	Yes 100% accurate ★★★★★	Yes 100% accurate ★★★★★	No. The detection results are not reliable ★
Overall verdict	★★★	N/A	★★★★	★★★★★	★★★★★	★

Table 8. Shows ease of use from an academic users' perspective

Appendix C

Performance Results of Tools to Detect Plagiarised Material

The following grid gives a detailed breakdown of the essays tested using the e-detection software and services. The scores awarded reflect the performance of the tools to detect the known instances of plagiarism in accordance with the performance as stated in the products' literature and webs site.

> **Key: Excellent ★★ ★★★ Good ★★★★ Acceptable ★★★ Poor ★★ Unsatisfactory ★**
> **Shaded area = collusion detection**

Service Tool	Cut and Paste		Collusion		
	EVE2 2.3	**Turnitin**		**CopyCatch**	**WordCHECK**
Function	Detects web plagiarism	Detects web plagiarism, paper-mills	Detects collusion	Detects collusion	Detects collusion
Essay No 1	Tested 8 times in Feb - Mar. Test 1,3,5,8 traced 4 sites. Test 2,4,6,7 traced 3 sites ★★★★	Tested 3 times in Feb-Mar-Apr. Test 1,2,3 traced 3 sites ★★★	Not tested	Tested 3 times in batch of 11 essays with similarity threshold at 50%, 40%, 30%. No collusion detected. ★★★★★	Tested twice with keyword setting at 40 and 90. No collusion detected. ★
Essay No 2	Tested 3 times in Feb-Mar. Test 1,2,3 traced 1 site. ★★★★★	Tested once in Feb. Traced 1 site. ★★★★★	Tested once in batch 7 essays. Collusion detected. Match with essay 3 ★★★★★	Tested 3 times in batch of 11 essays with similarity threshold at 50%, 40%, 30%. Collusion detected 85.4% match essay 3 ★★★★★	Tested 5 times with keyword setting at 50-90. Collusion detected 52% match with essay 3 ★
Essay No 3	Tested 6 times in Mar. Test 2,5,6 traced 3 sites. Test 1,3,4 traced 2 sites ★★★★	Tested 3 times in Feb-Mar-Apr. Test 1,2 traced 3 sites. Test 3 traced 2 sites ★★★★	Tested once in batch of seven essays. Collusion detected. Match with essay 2 ★★★★★	Tested 3 times in batch of 11 essays with similarity threshold at 50%, 40%, 30%. Collusion detected 85.4% match essay 2 ★★★★★	Tested 5 times with keyword setting at 50-90. No collusion detected. No match with essay 2 found. ★
Essay No 4	Tested 3 times in Feb-Mar. Not traced to paper-mill. ★	Tested twice in Feb-Mar. Not traced to paper-mill. ★	Not tested	Tested 3 times in batch of 11 essays with similarity threshold at 50%, 40%, 30%. No collusion detected. ★★★★★	Tested twice with keyword setting at 50 and 90% No collusion detected. ★
Essay No 5	Tested 3 times in Feb-Mar. Not traced to paper-mill. ★	Tested twice in Mar-Apr. Traced to 3 paper-mills Mar- Apr Chukii.com Goldenessays.com Cheater.com ★★★★★	Not tested.	Tested 3 times in batch of 11 essays with similarity threshold at 50%, 40%, 30%. No collusion detected. ★★★★★	Tested twice with keyword setting at 50& 90. No collusion detected. ★

Essay No 6	Tested twice in Feb-Mar. Not traced to paper-mill. Mar traced 2 sites with match. Apr, traced 2 sites with match. Revealing poor referencing. ★	Tested twice in Mar-Apr. Traced to paper-mill both times. Mar - traced 5 sites with match. Apr, traced 4 sites with match. Revealing poor referencing. ★★★★★	Not tested.	Tested 3 times in batch of 11 essays with similarity threshold at 50%, 40%, 30%. No collusion detected. ★★★★★	Tested twice with keyword setting at 50 and 90. No collusion detected. ★
Essay No 7	Tested once in Feb. No matching sites found. ★★★★★	Tested once in Feb. String of 8 words matched to 1 site accidentally. ★★★★★	Tested once in batch of seven essays. Collusion detected. Matched with essays 8 and 9 ★★★★★	Tested 3 times in batch of 11 with similarity threshold at 50%, 40%, 30%. Collusion detected. 100% match with essay 8, and 97.4% match with essay 9. ★★★★★	Tested once with keyword setting at 50. Collusion detected 100% match with essay 8. ★
Essay No 8	Tested once in Feb. No matching sites found. ★★★★★	Tested once in Feb. No matching sites found. ★★★★★	Tested once in batch of 7. Collusion detected. Matched with essays 7 and 9. ★★★★★	Tested 3 times in batch of 11 with similarity threshold at 50%, 40%, 30%. Collusion detected. 100% match with essay 7 and 97. 4% match with essay 9. ★★★★★	Tested once with keyword setting at 50. Collusion detected 100% match with essay 7. ★
Essay No 9	Tested once in Feb. No matching sites found. ★★★★★	Not tested	Tested once in batch of 7 Collusion detected. Match with essays 7 and 8. ★★★★★	Tested 3 times in batch of 11 with similarity threshold at 50%, 40%, 30%. Collusion detected 97.4% match with 7, and 97.4% match with 8. ★★★★★	Not tested. This essay was not available when the WordCHECK tests were performed. ★
Essay No 10	Tested once in Feb. No matching sites found. ★★★★★	Tested once in Feb. No matching sites found. ★★★★★	Tested once in batch of 7 Collusion detected. Match with essay 11. ★★★★★	Tested 3 times in batch of 11 with similarity threshold at 50%, 40%, 30%. Collusion detected. 86.1% match with essay 11. ★★★★★	Tested 5 times with keyword setting at 50-90. No collusion detected. No match with essay 11 found. ★
Essay No 11	Tested once in Feb. No matching sites found. ★★★★★	Not tested.	Tested once in batch of 7. Collusion detected. Match with essay 10. ★★★★★	Tested 3 times in batch of 11 with similarity threshold at 50%, 40%, 30%. Collusion detected. 86.1% match with essay 10. ★★★★	Tested 5 times with keyword setting at 50-90. No collusion detected. No match with 10 found. ★
Overall verdict:	Report not clear. Highlighting erratic. ★★★	Very good overall results. Clear report. ★★★★	100% accurate results. Very clear report ★★★★★	A very reliable program. Offers a selection of analysis options. ★★★★★	Not suitable for detecting collusion. Results are not reliable. ★

Table 9: Shows performance of the software and tools to detect different types of plagiarism

Appendix D

Descriptions of the Essays used in the Trial

The assignment tasks were drawn from six disciplines and essays were composed in the following subjects: biology (essay no. 1), literature (essays no 2 and 3), politics (essays no 4), computing (essays no 5 and 6), psychology (essays no 7, 8 and 9), and management (essays no 10 and 11).

The 11 documents were grouped in four categories:

- Essays obtained from on-line essay banks, 'paper-mills'. (2 UK, 1 US)
- Essays containing material copied and pasted from the World Wide Web.
- Essays written in collusion with others but with no Internet material included.
- One 'hybrid', an essay written in collusion plus containing some copied Internet material.

To make the essays easier to track through this report they are numbered.

Topic	Essay	Word count	Amount copied	Source
homeostasis	1	855	51%	4 web-sites
censorship	2	928	4%	Hybrid of 1 web-site + collusion (essay 3)
censorship	3	1348	24%	3 web-sites + collusion (essay 2)

Table 10: Essays cut and pasted from Internet

Topic	Essay	Word count	Amount copied	Source
Politics	4	956	N/A	UK www.revise.it
Software	5	2110	N/A	UK www.essaybank.com
Computer	6	1810	N/A	US www.hspapers.com

Table 11: Essays from paper-mills

Topic	Essay no	Word count	Amount shared %	Source
Psychology	7	2330	100	Essays 8 and 9
Psychology	8	2330	100	Essays 7 and 9
Psychology	9	1993	97	Essays 7 and 8
Management	10	3450	86	Essay 11
Management	11	1990	86	Essay 10
Censorship	3	1348	85	Essay 2

Table 12: Collusion between writers

Appendix E

Details of Project Team Members

Joanna Bull - Project Manager

Joanna is Head of Research in Teaching and Learning at the University of Luton, and Project Manager for the Computer-assisted Assessment (CAA) Centre. Previously she worked on the Assessment of Learning through Technology, Efficiency and Rigour TLTP project at the Universities' and Colleges' Staff Development Agency. Her most recent publications include articles and books on the assessment of student learning and strategies for implementing computer-assisted assessment. She has managed, and been an external evaluator of, a number of HEFC research projects, has run numerous workshops and presented at conferences in the fields of assessment and learning technology nationally and internationally.

Carol Collins - Research and Survey

Carol is a research fellow in the Teaching and Learning Department at the University of Luton and has experience of conducting research on a national development into innovations in teaching and learning, including the use of learning technologies and software for assessment purposes. Carol has lectured in the further education sector and has a BA (Hon's) degree in Linguistics, Cert TESOL, (Trinity) and a PGCE. Carol has experience of creating an electronic corpus of examination scripts and conducting computer-assisted error analysis of the texts. She is currently researching computer-assisted text analysis for a higher degree, involving corpus linguistics, natural language processing and lexicology.

Elisabeth Coughlin - Software and Services Trial from Academic User Perspective

Elisabeth is a staff developer in the Department of Teaching and Learning Research. She has a degree in linguistics with emphasis on historical linguistics and the teaching of English as a foreign language. She has worked as an EFL tutor and has been involved in the production and marking of the University of Luton English Language Examinations for overseas students.

Dale Sharp - Computing and Technical Review

Dale has worked within higher education information systems for over 8 years, and currently manages the Computer Services Department, which supports over 14,000 users, on 17 geographically separated sites, with a wide range of application software and networked systems. As computer services manager he reviews and selects software for widespread institutional use, and a strong technical background complements his experience of evaluating and managing the large-scale implementation and support of information technology and systems.

Appendix F

Disclaimer

This report and the judgments contained within it are published in good faith but no responsibility is accepted for the accuracy of any of the information contained in the report or for the performance of any of the products evaluated in it. Purchasers must satisfy themselves that any product referred to in this report will be suitable for their individual needs.