

Plagiarism: Prevention, Practices and Policies, Newcastle upon Tyne, 2004

May 2004

Online plagiarism detection services – saviour or scourge?

Lucy McKeever,

Netskills,

Information Systems and Services,

University of Newcastle upon Tyne, NE1 7RU

Email: lucy.mckeever@ncl.ac.uk

Phone: +44 191 222 5002

Fax: +44 191 222 5001

Abstract

Although the exponential growth of the internet has made it easier than ever to carry out plagiarism, it has also made it much easier to detect. This paper will give an overview of the many different methods of detecting web-based plagiarism which are currently available, assessing practical matters such as cost, functionality and performance.

Different types of plagiarism detection services will be briefly outlined by broad category. The paper will then consider the relative advantages and disadvantages of the different methods, referring to comparative studies where possible. It will also draw out some of the more general drawbacks of electronic detection, ranging from practical matters such as technical restrictions, data protection issues, and cost, to the human impact on staff and students alike.

It will counterbalance this by outlining the many possible benefits of implementing online detection in academic institutions, aside from the obvious pragmatic time-saving if dealing with large cohorts of students. It will argue that if online detection is used in conjunction with the many valuable 'anti-plagiarism' resources and tutorials available on the web, it really can become a positive teaching aid for staff and students alike, rather than a threatening online policing system.

The paper will conclude with a brief forecast for the future of plagiarism detection, and will emphasise that any form of online detection service can only act as a mere diagnostic tool to highlight possible cases of plagiarism, with human judgement always needed to investigate further.

1. Introduction

The apparent growth of plagiarism in academic institutions in recent years has attracted considerable media coverage. The rather alarmist tone of reporting has tended to portray the plagiarism 'epidemic' as both a symptom and cause of declining academic standards, as well as offering yet more evidence of the pernicious impact of the internet on society. Behind the sensational headlines, however, there is little doubt that the possibility of using simple 'DIY' copy and paste techniques to purloin and pass off at random from this vast information resource proves irresistible temptation for some, even before one takes into account the explosion in commercial 'essay bank' sites offering ready-made solutions for those with money to spend.

However, although the exponential growth of the internet has certainly made it easier than ever to carry out plagiarism, it has also made it much easier to detect. This paper will give an overview of the many different methods of detecting web-based plagiarism which are currently available, assessing practical matters such as cost, functionality and performance, while also drawing together general observations about the potential positive and negative impacts of implementing online detection services in academic institutions. Space does not permit a detailed overview of every product on the market, but the paper seeks instead to outline the different categories of detection services, and their relative advantages and drawbacks.

2. What is Plagiarism Detection?

Plagiarism detection has of course existed for as long as plagiarism itself, and many tutors would stress that they have long been adept at using their own low-tech, but highly intuitive methods to spot plagiarism in student essays. Automation in plagiarism detection has emerged more recently, with early research in the field focusing largely on detecting plagiarism in computer programs, while recent years have seen considerable developments in the online detection of text-based plagiarism. Most automated plagiarism detection services' aims are twofold; to highlight possible plagiarism, and also to identify the potential source of the plagiarised paper. Hence, as Clough (2003: 4) writes, "*the plagiarism detection task is different from authorship attribution but deeper than information retrieval.*"

As this paper will demonstrate, the principles and practices behind the automated services vary considerably, but the overall strategy tends to remain the same. Culwin and Lancaster (2001) delineated a four stage process of automated plagiarism detection; collection, in which the work is submitted, usually by uploading a file, detection, in which the work is checked against the detection service, confirmation, during which the work is then manually checked again by a human being to assess whether any text highlighted as suspect has indeed been plagiarised, and finally, if appropriate, investigation, during which the student and his/her work would be scrutinised using the institution's own disciplinary framework. All of the services described here can be fitted into this four stage paradigm.

3. Overview of detection services

3.1 Search-based systems

Most textual plagiarism detection tools operate by using a variety of submission and search techniques, whereby the content of submitted essays is checked against various sources, such as web sites, essay banks and other assignments uploaded to the service. Most use search engine technology to identify similarities between sections of the submitted text and web sites, usually looking for overlaps between strings of text. This is based on the premise that two writers are unlikely to use exactly the same sequence of words above and beyond a certain phrase length. The output from these services is usually in the form of a report, often using colour-coding and hypertext links to enable the end-user to home in on both potentially plagiarised text in the submission, and also the possible internet source.

Some of the better-known products in this field include the web-based service, Turnitin¹, produced by iParadigms and used by various organisations, such as the JISC Plagiarism Detection Service,² as well as the downloadable Essay Verification Engine (EVE).³ As there is quite a degree of overlap between the modus operandi of the textual comparison services, most products try to promote particular enhancements which differentiate their goods from the rest. For example, Scriptum⁴ claims to be able to detect slight linguistic modifications, such as a change of verb, as well as verbatim copying, and it also converts all submitted documents to PDF before running them through the plagiarism detection service, to avoid problems of format incompatibility. MyDropBox also claims that it is not limited to uncovering verbatim copying, “by utilizing innovative artificial intelligence module” (sic.)⁵ Like Turnitin, it also broadens its coverage beyond the merely visible web by searching password-protected databases of journal articles, and other assignments submitted to the service.

A search-based service which operates along rather different lines is OrCheck⁶, produced by Fintan Culwin of South Bank University. This uses Google technology to find documents which may be similar to the one submitted. It constructs search terms by analysing the frequency of word concordances in the submitted work, searches for these terms on Google, and then compares the essay with the sites found on Google to pick out similarities, flagging up those sites which seem to merit further investigation.

3.2 Linguistic analysis

Glatt Plagiarism Services⁷ produces a very different form of textual plagiarism detection service, which has a resonance with the analytical principles used in forensic linguistics (for example to determine the veracity of witness statements). This service, based on the cloze procedure, operates on the principle that everyone has their own writing style, and can recall it if necessary. The text is submitted electronically, and is then returned to the writer with every fifth word eliminated, requiring the writer to fill in the

¹ <http://www.turnitin.com>

² <http://www.submit.ac.uk>

³ <http://canexus.com/eve/index.shtml>

⁴ <http://www.scriptum.ca/index.html>

⁵ <http://www.mydropbox.com/services.html>

⁶ <http://cise.sbu.ac.uk/orcheck/>

⁷ <http://www.plagiarism.com/>

blanks. A 'Plagiarism Probability Score' is then calculated, based on the number of correct words filled in, and the time taken to complete the exercise.

The key advantage of this service over others is that it is not just limited to detecting plagiarism in web-based sources. The programme makers unsurprisingly claim that it has proved very accurate, but it has been criticised for the intrusive and time-consuming process involved in undergoing the test, which provoked the ire of Satterwhite and Gerein (2003: 6), "It reminded us of taking a lie detector test before you are hired for employment – you have to prove your innocence." Like many of the detection services, Glatt also offers a broader remit, including tutorials exploring what is meant by plagiarism, and how to avoid it.

3.3 Collusion detection

Some services focus on searching for possible collusion among a cohort of submitted texts ('intra corpal' plagiarism), rather than looking for 'extra-corporeal' plagiarism which plunders external sources such as web sites. Indeed, Clough (2003: 4) indicates that initially, most research into automated plagiarism detection focused much more on the detection of collusion rather than of extra-corporeal plagiarism. One of the most well-known collusion detection tools in the UK is CopyCatch⁸, which aims to identify similarities between texts submitted to the service, and as Wools (1999) explains, it "works by exploiting the fact that the majority of the words in an essay will be used only once." An American programme, Wcopyfind⁹ also focuses on collusion detection, highlighting sections of documents in a cohort which share large portions of text.

Philip Denton has produced a collusion detection package based on strikingly different principles, entitled Electronic Feedback¹⁰. This measures the similarity between feedback given to students electronically by the marker, and relies on the hypothesis that similar work is likely to receive similar feedback. One of the key advantages of this over other services is that it could also be used to assess hand-written work, though as the author himself says, "Clearly...the Electronic Feedback concept relies heavily on the competence of the assessor" (Denton 2002).

3.4 Software detection

As Clough (2003) indicates, most work in the plagiarism detection field focused initially on software plagiarism, partly because software plagiarism is easier to detect, since it focuses on constrained, rather than free text. Culwin (2000: 2) also states that free text detection "has only become feasible in the last couple of years with dramatic drops in the price of processing power and memory." There are various services on the market which look for similarities between software programmes, including, JPlag¹¹, MOSS (Measure of Software Similarity),¹² and YAP (Yet Another Plague)¹³, with links to more tools

⁸ <http://www.copycatch.freereserve.co.uk/vocalyse.htm>

⁹ <http://plagiarism.phys.virginia.edu/Wsoftware.html>

¹⁰ <http://cwis.livjm.ac.uk/cis/download/xlfeedback/welcome.htm>

¹¹ <http://www.jplag.de/>

¹² <http://www.cs.berkeley.edu/~aiken/moss.html>

available at other sites.¹⁴ Much has been published in this area, though obviously any product reviews quickly become dated. Clough (2003) offers one of the more recent overviews of several software plagiarism detection services, describing how such detection has developed from 'attribute counting' to 'structure based' methods.

3.5 Using search engines

Perhaps one of the most widely used forms of online plagiarism detection (certainly from unscientific 'straw polls' of attendees on the Netskills 'Detecting and Deterring Plagiarism' workshops¹⁵) is that of simply using a search or metasearch engine to try and locate the source of a suspiciously familiar, unusual or ornate phrase which suddenly crops up in a student essay. Certainly the technique is quick and simple – typing in a phrase search on Google such as “heralded as his best use of both irony and sarcasm” quickly brings back several versions of the same paper on Jonathan Swift which has appeared on several essay banks. However, discrepancies in search engine coverage mean that this is rather a hit and miss approach, and also quite labour intensive, since the marker has to manually select likely phrases to search, rather than relying on the software to do this automatically.

3.6 Using common sense

While it is difficult to get any accurate data on the proportion of academic staff using automated detection, it would seem reasonable to state that the majority of UK teaching staff do not (again reinforced unscientifically by feedback from Netskills plagiarism workshop attendees from many different institutions). This may be partly attributable to the fact that many tutors consider themselves well able to spot plagiarism using their own commonsense techniques, and whether a sophisticated automated service can ever be as effective as the simple intuition and linguistic perspicacity of a human being, remains to be seen. Obvious tell-tale lexical and syntactical clues such as changes in voice or tense, improbably sophisticated writing style, out-dated, obscure or non-existent references, and disjointed text can all ring warning bells in a marker's head, though there will always be the obliging student who helpfully cites the source of the plagiarised text in his/her bibliography (or even better, plagiarises the tutor).

4. Comparison of methods

With such a bewildering range of products and techniques available, there is a compelling need for up-to-date comparative research into their relative effectiveness, yet so far the work in this area has been quite patchy. The JISC carried out a detailed review of collusion and plagiarism detection services in 2001, focusing on both the user and technical perspective (Bull et al. 2001). However, this informative review clearly merits an update, since some of the services, such as WORDCheck, which received a poor report, and FindSame, which received a very good report, do not appear to exist anymore, and Turnitin is criticised for its slow reporting time, though this has reduced from 24 hours to a matter of seconds since

¹³ <http://www.cs.su.oz.au/%7Emichaelw/YAP.html>

¹⁴ See for example <http://cise.lsbu.ac.uk/tools.html>

¹⁵ <http://www.netskills.ac.uk/workshops/descriptions/plag.html>

the report was written. A more recent overview, which highlights some of the findings from JISC, was produced by VAIL (2002).

Culwin (2000) gives a critical overview of software and free text detection services, though at the time the article was written, there were very few free text services available. He concludes that Integriguard is "generally unsatisfactory", Plagiarism.org is "very good", though prohibitively expensive for most academic institutions, EVE produced the least convincing results, while Copycatch was the easiest to use and represented the best value for money.

Satterwhite and Gerein (2003) conducted one of the most interesting projects, in which they submitted a range of plagiarised papers (both free and paid for) to various detection services. All the products they tested used key phrase searching to try and locate text sources in other papers. Their findings revealed quite a surprising divergence in results, with some expensive and apparently sophisticated automated detection services faring little better than a simple search engine phrase search. The authors found services such as Howoriginal or Paperbin (neither of which appear to exist now) to be particularly ineffective as they picked frequently occurring phrases or single words to check, while the now defunct WORDCheck rather unhelpfully required the end-user to identify in advance the possible source of the paper. While the authors were most impressed with Turnitin, they gave this overall conclusion, "We were disappointed in the seemingly random nature of the passage checking in some of the programs/services – a clear correlation is observable, we find, between poorly selected passages and the low rate of detection." (Satterwhite and Gerein 2003: 6). Comparative reviews of functionality, rather than performance, are similarly difficult to find, other than Clough (2000) and a chart produced by Gillis and Rockwell-Kincanon.¹⁶

5. Disadvantages of electronic detection

5.1 Limits of scope

Despite the somewhat grandiose claims made by some detection services, for example, "with MyDropBox technology, your educational institution can be plagiarism free,"¹⁷ there are inevitable limitations in their scope. As automated plagiarism detection was initially focused on examining computer programmes for code similarities, this rather mechanistic approach does not necessarily lend itself to the subtle and sophisticated analysis of free text vocabulary. Furthermore, a service which searches for similarities in strings of text may not acknowledge that writing style differs from subject to subject, and that it is not unusual to have phrases as long as 6-7 words frequently occurring in certain subject areas. Certainly some observers such as Grover (2003: 3) feel that a rather rigid solution is being applied to an imprecise and complex problem; "The definition of plagiarism is too indeterminate to allow a quantitative measure."

¹⁶ <http://www.wou.edu/provost/library/staff/kincanon/plagiarism/chart.htm>

¹⁷ <http://www.mydropbox.com/services.htm>

Search-based detection services are also limited in terms of their coverage. Most services can only search for web-based plagiarism, and even then, they are largely limited to searching only the 'visible' web which is indexed by search engines. As research has shown¹⁸, a significant but unquantifiable proportion of the web will never find its way into search engines, and frustratingly, it is precisely the 'invisible' web sources, such as password-protected databases of journal articles and essay banks, which are likely to contain the source of plagiarised content. Furthermore, most of the services will be unable to detect 'bespoke' essay writing such as that offered by services such as Elizabeth Hall Associates¹⁹. Indeed, such ghost-writing companies boast of their ability to beat detection services.

In addition, many of the services can only highlight text sequences which are a verbatim copy from another text. Thus, the subtle plagiarist who uses word rearrangement or makes judicious use of synonyms, may be able to cover their tracks and beat the system. However, since plagiarism is often deemed to be a product of laziness and/or poor time management, it would seem counter-intuitive for someone to go to such laborious efforts to conceal their plagiarism.

While services may fail to detect some obvious occurrences of plagiarism, there is at the same time a danger of false positives. Some services, such as Turnitin, are unable to distinguish between correctly cited text in quotation marks, and illegitimately plagiarised text, though this can be overcome by resubmitting the work with the correctly quoted text excluded from detection. Dehnart (1999) also highlighted false reporting of plagiarism, describing how he submitted his thesis to a plagiarism detection service, only to find it reported possible plagiarism of another web site on which his thesis had been published. In somewhat hyperbolic tones he expresses horror that he could have been wrongly expelled from university for cheating, and that "the service came across like a hanging judge". Though his concerns may be well-founded, it would be an extraordinarily obtuse institution which would expel a student on such flimsy and flawed evidence.

5.3 Technical restrictions

Despite their increased sophistication, many of the services still impose certain technical restrictions, which may cause frustration to the end-user, with Culwin, in his review of several products (2000:4) explaining how "the submission process for students ranges from poor to satisfactory". For example, OrCheck only deals with files in .txt format, while Scriptum can cope with any word processing format, but converts documents to .pdf first. Other services require a fair degree of technical competence on the part of the user - for example, OrCheck requires the end-user to set up a Google key before use. In terms of platform, this choice depends very much on the end-user, with some services extolling the fact that they are web-based and thus require no installation or downloading of tools, while others stress that because they are standalone they do not rely on fast network connections.

5.2 Lack of product stability

¹⁸ See, for example <http://library.albany.edu/internet/deepweb.html>

¹⁹ <http://www.elizabethhall.com/>

As with many emerging software markets, the plagiarism detection sector is quite volatile. This instability not only makes purchasing decisions for academic institutions more risky, but also inhibits comparative studies. Some detection services appear, disappear or change drastically with little warning. Some of the products featuring in articles just a few years ago but now no longer in existence include Findsame, Howoriginal, Integriguard, Plagiserve and Edutie. Other tools, while no doubt highly promising, are still at an experimental and developmental stage, with an almost home-made feel enveloping some of them. Aspects such as online support and documentation may not be well developed either, a factor observed in the JISC Review (Bull 2001). Finally, to what is already a rather unstable market, we must add the potentially explosive ingredient of apparent conflicts of interest, with some services attracting controversy because of suspected links with essay banks, perhaps demonstrating a ‘poacher-funds-gamekeeper’ approach.

5.4 Administrative and cost issues

One of the key administrative hurdles to be overcome when operating certain detection services is that of data protection. For example, anyone using the JISC plagiarism detection service must obtain written consent from students before their work can be submitted, in order to comply with UK data protection legislation. This is a significant administrative requirement which needs to be carefully managed, and has certainly proved to be a key concern of attendees on the Netskills workshops. Scriptum and other services avoid this by not storing the submitted documents.

Many of the detection services stress the impressive time-saving possibilities they offer to over-worked teaching staff, with products such as Scriptum offering the appealing slogan “take back your weekend”. However, anecdotal evidence suggests that some staff see the use of automated detection as another burden. Even the most straightforward service will require training time, while teaching and marking practices may have to be drastically revised in order to incorporate the detection process. In truth, as one writer comments, "In academia, plagiarism detection is generally down to the knowledge, ability, time and effort of the lecturer/teacher assessing the student's work." (Clough 2003: 4)

Finally, there is the crucial issue of cost. While some services such as Jplag, MOSS, OrCheck and Jiscpas offer free academic licences (for now), others charge fairly hefty flat-rate fees, or fees per submission. The need for payment is explained in disingenuously noble fashion by one service thus, “In a perfect world, money would not be an issue. Alas, we have to charge our users reasonable licensing fees to support existence and further improvement of our service.”²⁰

5.5 Ethical issues/impact on culture

Recent evidence of an emerging backlash against plagiarism detection (see for example Levin 2003) demonstrates that the introduction of online detection needs to be sensitively handled to avoid building up a culture of resentment among students, and fear among staff, with institutions becoming embroiled in

²⁰ <http://www.mydropbox.com/new.htm>

futile cat and mouse games as the plagiarists try to beat the system. With the stakes high, more serious repercussions could include damaging disciplinary cases and legal battles.

While it may be an appealing conclusion that the student who does not want to co-operate with the plagiarism detection service may have something to hide, it is also possible to see that students may feel indignant at what they see to be a presumption of guilt lying behind the implementation of plagiarism detection. One student at McGill University recently refused to allow his work to be submitted to Turnitin, arguing somewhat spuriously that he did not want to help a private company make a profit from his paper (Fine 2003). Nonetheless, we should also stress that in some cases, the impetus to introduce electronic plagiarism detection came from students themselves, aggrieved at apparently unpunished plagiarism from others on their course (Wotjas 1999).

One key worry is whether the services can successfully navigate the difficult dividing line between producing easily understandable reports, without making them so undemanding as to encourage oversimplistic interpretations. It is difficult not to be swayed by the colour coded report which flags several paragraphs up in guilty shades of damning scarlet, and some services do make claims which seem to overstate their capabilities, for example, “The Test results provide teachers with objective evidence regarding plagiarism guilt or innocence”²¹

6. Advantages of online detection

Despite all these potential drawbacks, there are many key advantages to using plagiarism detection. Perhaps the most notable, in this day of mass student numbers, is that of time saving. Larkham (2003) describes a series of cases in which the alleged plagiarism from ‘traditional’ (i.e. print) sources was investigated without the aid of an automated detection service (apart from one in which Google was used), and he highlights the time-consuming and laborious process involved, estimating 16 person hours to investigate one case. Furthermore, modularisation, expansion of numbers, and anonymous marking mean that even the most astute tutors will find it hard to build up the familiarity with their students’ writing style which they could previously. Added to this, the massive information escalation caused by the Internet means that the tidily demarcated canon of literature to which students might have been expected to restrict themselves previously in certain subject areas, has now been exploded to include a vast range of web based materials, with tutors unlikely to have the time to follow up all references.

Furthermore, despite its rather intimidating portrayal by some, online detection can, if handled judiciously be employed as a beneficial educational tool rather than in solely punitive fashion, enabling a tutor firstly to assess the scale of a plagiarism problem, and then to work with students to deal with it in a constructive manner, particularly with some detection services offering rewrite and self-test facilities. Detection also opens up a controversial issue which is often conveniently overlooked, and as Duggan (quoted in Utlely 2003) says, “the originality report can be used to open a dialogue between the student and academic about issues such as academic integrity and the importance of acknowledging original sources.” If online

²¹ <http://www.plagiarism.com/screen.id.htm>

detection is used in conjunction with the many valuable 'anti-plagiarism' resources available on the web, including tutorials, discussion forums and good practice guides, then it really can become a learning aid, rather than a sinister threat, for students and tutors alike. What does seem clear is that while detection alone is not an option, automated services do have their place, as “the scope of the problem exceeds the human controls currently in place.” (Wools 1999).

7. Conclusion - what does the future hold for plagiarism detection?

This paper has stressed that plagiarism detection is still an emerging technology, so there are likely to be many more developments and improvements in future years, as services improve all the time. Certainly it seems that more services will follow the example of Scriptum and become integrated into VLEs, or broaden their scope so that the plagiarism detection module is merely one part of a wider service, such as Surfswax Scholar²² which is a research and communication service for students and teachers. Clough (2003) suggests other new areas of research for plagiarism detection, including multi-lingual detection; building up an online text library to enable better independent comparison across different services, and the use of natural language processing.

More comparative research into the effectiveness of different services, together with data about their implementation and usage in higher and further education, and best practice case studies showing how particular services have been incorporated into teaching and learning, would also seem very profitable avenues of investigation. At the moment the impression received is that the majority of tutors are watching nervously on the sidelines while an intrepid few embrace plagiarism detection wholeheartedly.

In conclusion, the decision of whether to use online detection, and what type, is a matter for individual tutors and institutions, must be informed by careful research and planning, and should be implemented thoughtfully. Most importantly, any form of online detection service can only act as a mere diagnostic tool to highlight possible cases of plagiarism, and human judgement will always be needed to establish whether or not an offence has been committed.

²² <http://scholar.surfswax.com/>

Notes

1. <http://www.turnitin.com>
2. <http://www.submit.ac.uk>
3. <http://canexus.com/eve/index.shtml>
4. <http://www.scriptum.ca/index.html>
5. <http://www.mydropbox.com/services.html>
6. <http://cise.sbu.ac.uk/orcheck/>
7. <http://www.plagiarism.com/>
8. <http://www.copycatch.freemove.co.uk/vocalyse.htm>
9. <http://plagiarism.phys.virginia.edu/Wsoftware.html>
10. <http://cwis.livjm.ac.uk/cis/download/xlfeedback/welcome.htm>
11. <http://www.jplag.de/>
12. <http://www.cs.berkeley.edu/~aiken/moss.html>
13. <http://www.cs.su.oz.au/%7Emichaelw/YAP.html>
14. See for example <http://cise.lsbu.ac.uk/tools.html>
15. <http://www.netskills.ac.uk/workshops/descriptions/plag.html>
16. <http://www.wou.edu/provost/library/staff/kincanon/plagiarism/chart.htm>
17. <http://www.mydropbox.com/services.htm>
18. See, for example <http://library.albany.edu/internet/deepweb.html>
19. <http://www.elizabethhall.com/>
20. <http://www.mydropbox.com/new.htm>
21. <http://www.plagiarism.com/screen.id.htm>
22. <http://scholar.surfswax.com/>

References

Bull, J. *et al.* (2001) *Technical review of plagiarism detection software report*. University of Luton [Online]. Available at: http://www.jiscpas.ac.uk/site/pubs_detect_dettech.asp (Accessed: 16 April 2004).

Clough, P. (2000) *Plagiarism in natural and programming languages: an overview of current tools and technologies* [Online]. Available at: <http://www.dcs.shef.ac.uk/%7Ecloughie/papers/Plagiarism.pdf> (Accessed: 16 April 2004).

Clough, P. (2003) *Old and new challenges in automatic plagiarism detection*. [Online]. Available at: http://www.jiscpas.ac.uk/site/pubs_detect_paulclough.asp (Accessed: 16 April 2004).

Culwin, F. & Lancaster, T. (2000) 'A review of electronic services for plagiarism detection in student submissions'. *LTSN-ICS 1st Annual Conference, Edinburgh*, LTSN. [Online] Available at: <http://www.ics.ltsn.ac.uk/pub/conf2000/Papers/culwin.htm> (Accessed: 30 April 2004).

Culwin, F. & Lancaster, T. (2001) 'Plagiarism issues for higher education', *Vine*, 123, pp. 36-41.

Dehnart, A. (1999) *The Web's plagiarism police*, Salon.com. [Online]. Available at: <http://www.salon.com/tech/feature/1999/06/14/plagiarism/index.html> (Accessed: 16 June 2003).

Denton, P. (2002) *Detection of collusion using a novel MS marking assistant* [Online]. Available at: http://www.jiscpas.ac.uk/site/pubs_detect_collusion.asp (16 April 2004).

Fine, P. (2003) 'Student aims to catch cheats', *Times Higher Education Supplement*, 28 November.

Grover, D. (2003) 'The use of correlation techniques to detect plagiarism', *Computer Law and Security Report*, 19(1), pp. 36-38.

Larkham, P. (2003) *Exploring and dealing with plagiarism: traditional approaches* [Online]. Available at: http://www.jiscpas.ac.uk/site/pubs_goodprac_larkham.asp (21 November 2003).

Satterwhite, R & Gerein, M. (2003) *Downloading Detectives: Searching for Online Plagiarism* [Online]. Available at: http://www2.coloradocollege.edu/Library/Course/downloading_detectives_paper.htm (Accessed: 21 November 2003).

Utley, A. (2003) 'Cyber sleuths hunt for a way to end plagiarism', *Times Higher Education Supplement*, 8 August.

Virtual Academic Integrity Laboratory (2002) *Faculty and Administrators' Guide: Detection tools and methods* [Online]. Available at: http://www.umuc.edu/distance/odell/cip/vail/faculty/detection_tools/detectiontools.pdf (30 April 2004).

Woolls, D. (1999) 'Computer programs can catch out copycat students', *Times Higher Education Supplement*, 3 September.

Wojtas, O. (1999) 'Students asked for cheat alert', *Times Higher Education Supplement*, 3 September.