



Use of text-matching software in education and research: a review of select literature

Shipra Awasthi^a and Manorama Tripathi^b

^aAssistant Librarian, Jawaharlal Nehru University, New Delhi-110067,

E-mail: shipra2010@gmail.com

^bLibrarian, Jawaharlal Nehru University, New Delhi, New Delhi-110067,

E-mail: manoramatripathi2@yahoo.com

Received: 25 January 2021; revised: 02 May 20201; accepted: 07 May 2021

The paper reviews the literature and dwells upon the reasons behind the occurrences of plagiarism. It reiterates that the anti-plagiarism software are automated programs and should be used in conjunction with human intelligence and detailed human scrutiny. The authors highlights the advantages and disadvantages of using the anti-plagiarism software and recommend that training sessions and orientation programs be organized for the students and researchers to sensitize them to the basic principle of honesty in academic and research enterprise, impacting all the stakeholders.

Keywords: Misconduct; Plagiarism; UGC; Ethics; Anti-plagiarism software

Introduction

Worldwide, higher educational institutions (HEI) are considered epicentres of knowledge where rigorous methods of study and research are followed to generate new knowledge. The creation of new knowledge helps in addressing and resolving the challenges which mankind faces. The new knowledge results in judicious policymaking and global sustainable development. The HEIs are supposed to undertake education, research, and training by following the standards and norms of the field rigorously. There are no shortcuts for the successful generation of new knowledge. Integrity in education and research is of utmost importance. It implies ensuring compliance to ethical and professional principles standards and practices by individual students and teachers.¹ The honesty in education provides a foundation for students to follow high standards and best practices. The authentic assessment and integrity strengthen students' skills of employability. The universities worldwide have formulated policies for all stakeholders to follow and ensure compliance to integrity and ethics in education and research.²

The research objective is the quest for scientific truth and its communication to society by publishing the findings as journal articles, book chapters, conference volumes, books, etc. The whole publishing research activity works on the belief that authors,

reviewers, editors, and publishers are honest and are committed to their work. But it has been observed that some researchers tend to infract rules of research and its reporting and engage in different forms of misconduct.

Internet technology has revolutionized the way information is browsed, accessed, and used. It extends easy access to a vast amount of information from myriad resources. It is important to underscore here that information technology offers a counter, in the form of anti-plagiarism software, which runs parallel and detects the copied or similar content. The HEIs, have adopted various measures to ensure honesty and integrity in education and training. One of them is using anti-plagiarism software for checking and ensuring the originality of the research done. The various publishers have incorporated the use of anti-plagiarism tools in editorial and peer review proceedings. The journals use anti-plagiarism software to screen the manuscripts, and one of the reasons for desk rejections is duplicate publication and self-plagiarism.³ Plagiarism is the main reason for the retraction of articles published in scholarly journals.⁴ The UGC regulations (2018) have mandated the use of anti-plagiarism software for scanning theses and dissertations.

The reporting of originally generated data and articulation of ideas in one's own words are considered the basis of scholarly communication.

However, these ways are being compromised by instances of plagiarism. Plagiarism is stealing or misappropriating intellectual content without acknowledging the source and trying to pass it off as one's own. The different forms of plagiarism are: characters-preserving plagiarism, which includes verbatim copying, and source is also provided; syntax-preserving plagiarism entails using substitute techniques. Semantics-preserving plagiarism involves changing both sequences of words and the structure of sentences, but the meaning remains unchanged. This is also called as translation plagiarism. Idea-preserving plagiarism involves borrowing ideas from other sources and experts.⁵

A lackadaisical attitude to detect, penalize and prevent academic misconduct creates an impression that malafide practices are acceptable in education and research. The students know that they would not be punished for their misdeeds.⁶ Plagiarism is ubiquitous, unethical, and wreaks havoc for all the stakeholders.

Policies to ensure the integrity in education & research

University Grants Commission (Promotion of Academic Integrity and Prevention of Plagiarism in HEI) Regulations 2018 have mandated the use of anti-plagiarism software for scanning theses and dissertations. The limited detection and prevention are surely one reason for the widespread prevalence of academic dishonesty on campuses worldwide. The UGC regulations define 19 various terms like academic integrity, academic misconduct panel, author, college, commission degree, faculty, etc. These regulations aim to create awareness among all the stakeholders of HEIs regarding proper conduct to be followed in academic and research activities. They underline the importance of orientation sessions and training programs to spread awareness and uphold integrity in education and research.

The UGC regulations spell that references, bibliographies, table of contents, preface, acknowledgments, generic terms, laws, standard symbols, and equations should not be considered as plagiarized content, as these are considered as common knowledge. The regulations have graded similarity into four levels, i.e., 0-3. 0, 1, 2, and 3 which corresponds to similarity up to 10%, 10-40%, 40%-60%, 60% or more respectively. The regulations have prescribed different penalties for all four levels. The regulations have mandated that there should be

the Departmental Academic Integrity Panel (DAIP) to investigate the complaint and submit its recommendations to the Institutional Academic Integrity Panel of the HEI. The HEIs may take *suo motu* cognizance of an occurrence of plagiarism and initiate an inquiry. These regulations of the HEI are applicable to all students' faculty members and non-teaching staff.⁷

UGC has published a guidance document entitled Good Academic Research Practices for all researchers to follow in their research enterprises. The document has specified that researchers need to follow basic principles of ethics and honesty in research activities. The document has spelled-out steps, procedure, norms which the research must follow during the different stages of research- formulation of research questions, hypotheses, design, actual conduct, procedure or process and dissemination of research findings through honest, genuine outlets.⁸

UGC has approved two credit courses, "Research and Publication Ethics," to raise awareness about the publication ethics and misconduct. The courses are mandatory for Ph.D. students for the course work to be undertaken by them. It comprises six units emphasizing on the basics of philosophy of science and ethics, research integrity, and publication ethics. It also contains topics like open access publishing, research metrics, indexing and citation databases, and plagiarism tools. With the completion of these courses, the scholars' writing and publishing skills will be enhanced and developed.⁹

Tertiary Education Quality Standards Agency (TEQSA) requires higher educational institutions to develop policies to uphold academic integrity and provide education and training on what comprises good conduct in education and research (TEQSA, 2020).¹⁰ Moher et al. (2020)¹¹ have developed and elucidated the Hong Kong Principles (HKP), which underline that means are equally important as ends. They underscore that the researchers should be recognized for their compliance to ethics, integrity, high standards, proper conduct while pursuing research.

The objective of any research enterprise is to seek the truth, unveil any new perspective by following the scientific procedures of the domain and communicate the findings to the public through genuine publications. Generally, scholarly journals publish research findings assuming that all the stakeholders, publishers, editors, peer reviewers, authors have practiced honesty in their work. Sadly, it does not

always prevail, and researchers don't fight shy of cutting corners and engage in misconduct, ranging from less severe violations of ethical rules to most serious ones.

The section 17.0 code of professional ethics of UGC Regulations for appointment of teachers and other academic staff in universities and colleges and measures for the maintenance of standards in higher education 2018 spells out the responsibilities of teachers in colleges and universities across the country. The section specifies how they should conduct themselves, their responsibilities towards students, colleagues, authorities and society. They are expected to follow high standards of professionalism and inspire their students to do their best in academic and research endeavours.

ICMR (2019)¹² has laid out its policy on research integrity and publication ethics to ensure highest professional and ethical standards in the field of biomedical and health research. There should be honesty in research- proper data collection, maintenance and record, analysis, interpretation and reporting. Proper approval must be sought before undertaking research.

The different bodies have published various guidelines for research ethics (Table 1).

All the policy documents in Table 1 mention that there is problem of misconduct in education and research. All stakeholders have responsibility to address the various issues, viz., embezzlement of ideas, plagiarism, falsification, fabrication, fraud, non-compliance of regulatory guidelines, inappropriate authorship, reluctance to share data, gender issues and so on.

The guidelines mention that good practices should be followed regarding laboratory work, its record maintenance and approaches should be taken for research on humans and biological materials. The researchers should be sensitized to the guidelines and gravity of misconduct in education and research.

Need of text-matching software

The automated detection systems can highlight obfuscate and be hard to identify forms of academic plagiarism. This is due to semantic text analysis, identification of non-textual content, and mechanical learning. The use of different methods for detecting textual and non-textual content with machine learning will further enhance the detection.⁵

The knowledge of plagiarism detection software among the students reduces the occurrences of

Table 1 — Various guidelines published by different bodies

Sl. No	Institution	Guidelines
1.	CSIR (2019)	Guidelines for Ethics in Research and in Governance. https://www.csir.res.in/sites/default/files/OM%20Ethics%20Guidelines28-02-2020.pdf
2.	INSA (2018)	Policy statement on Dissemination and Evaluation of Research output in India. http://dialogue.ias.ac.in/dialogue-articles-pdf/PINSA_2018%20Lakhotia-Chaddha.pdf
3.	INSA (2019)	Ethics in Science Education, Research and Governance https://www.insaindia.res.in/pdf/Ethics_Book.pdf
4.	Ministry of Environment, Forest and Climate Change (MoEFCC)	Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA) to ensure research protocols on animals. http://cpcsea.nic.in/WriteReadData/userfiles/file/SOP_CPCSEA_inner_page.pdf
5.	PSA-GOI (Principal Scientific Advisor)	Draft National Policy on Academic Ethics https://www.psa.gov.in/psa-prod/publication/Draft%20National%20Policy%20on%20Academic%20Ethics%202.pdf
6.	UGC (2018)	(Promotion of Academic Integrity and Prevention of Plagiarism in Higher Educational Institutions) Regulations, 2018 https://www.ugc.ac.in/pdfnews/7771545_academic-integrity-Regulation2018.pdf
7.	UGC (2019)	Committee on Promoting and improving the quality of Research in Indian Universities. Report is in 2 parts: - (I) Improving the quality of Research by faculty and creation of new knowledge and strategies for improving research culture in colleges and universities. (II) Proposed UGC (Minimum standards and procedures for award of M.Phil./ PhD degrees) Regulations https://www.ugc.ac.in/pdfnews/9836633_Research-and-Publication-Ethics.pdf
8.	UGC (2020)	Good Academic Research Practices (GARP) https://www.ugc.ac.in/e-book/UGC_GARP_2020_Good%20Academic%20Research%20Practices.pdf

plagiarism. These software are needed because researchers often indulge in plagiarism in their research reporting. These are also required to improve the writing skills of the students. These software support the students to maintain the integrity in academic and research endeavors.¹³

Garg and Goyal (2016)¹⁴ have highlighted that 'Maulik', an anti-plagiarism software detects plagiarism in Hindi submissions. It divides the text of the submitted documents into n-grams and then matches them with already published documents. The teachers who used Turnitin and those who did not, both felt that large portions of student plagiarism were accidental, and both groups determined penalties on a case-by-case basis. The faculty members have similar perceptions about plagiarism, whether they use Turnitin or any other software.¹⁵ The researchers from different cultural backgrounds have different views regarding plagiarism.

There may be intentional or unintentional plagiarism. Cultural differences may play a role in appropriate and inappropriate information use in scholarly writing. In some environments, students are enculturated in such a way that they don't find anything wrong in copying from sources. The purpose of using anti-plagiarism software is not to treat every student as an offender but to help students learn from their mistakes, which may have severe consequences, and get them back on the right track.

Advantages of anti-plagiarism software

The use of the software reduces the rate of plagiarism in the students' work. When the students know that their acts of plagiarism will be caught, they exercise caution, make efforts to submit original work, try to express and write content in their own words; thus, they are empowered. The teachers can give feedback on the students' submissions, so the use of these software is time saving. Using these software, the students also learn to verify and give correct references.

When the students see the plagiarized contents of their submissions marked in red and the percentage of copied content, they are discouraged from repeating it. Belli, Raventos, and Guarda¹⁶ studied a different group of students of the engineering field pursuing a compulsory course of oral and written expression in universities of Spain. They found that the rate of plagiarism reduced with the use of these tools. Shang¹⁷ has observed the same trend-with the students' awareness about these tools, occurrences of

textual plagiarism goes down. But the relationship between the awareness about plagiarism and the students' actual plagiaristic behaviour can't be established. Chien¹⁸ has reported about teaching the students about plagiarism, ways to detect and avoid plagiarism in their writing, analyse writing, provide feedback and improve writing. These tools contribute to the overall learning process- help in grammar checking, in-text citation, and referencing.

Turnitin may help transform insecure novice writers into confident ones in academic discourse as they can avail of an easy system, with various modules to address their weak areas. It provides an intuitive platform to work and facilitates immediate feedback on their writing. The students should know how to use it to maximize student learning. Turnitin is the most favoured text-matching tool and has tremendous educational potential for student development.¹⁹ It offers a lot of autonomy to students to learn; the students may submit their assignments, check language, get feedback from their peers and teachers and thus improve their original draft submitted to the system. The faculty members may manage assignments electronically, evaluate and give their feedback on submissions electronically, even through audio files. It contributes to the overall learning activities of the students.²⁰ Its use is time saving. It should not be used as a policing tool but as a tool with educational potential for student development. It provides pedagogical interventions that help improve academic writing.¹⁹

Disadvantages of anti-plagiarism software

The rapid strides made in ICTs and user friendliness of social media have created opportunities for circumventing rules and regulations.²¹

The anti-plagiarism software helps in detecting textual similarity. But they can't detect other forms of misconduct like the use of fabricated or falsified data, manipulation of images, and so on. Even when contents are uploaded as image files, this anti-plagiarism software fails to detect similarity. Further, they do not detect occurrences of contract cheating, which is the submission of work for which the students have paid contractors to write for them. There are agencies known as contract cheating services or essay mills, which offer their services to the students to write bespoke essays, term papers, research assignments, dissertations, project reports, programming codes, etc.

The anti-plagiarism software does not detect any plagiarism because they are original and prepared by experts, who know that their work will be run through anti-plagiarism software. They do not claim their authorship as they charge fees for doing the work. The contract cheating websites that provide contract cheating services often claim that this form of cheating is undetectable. Though, 96% of the times, the markers were able to detect contract cheating.²² The researchers may get their work edited professionally before they submit it for evaluation and publication, and this is permitted by the universities. But substantive editing is not permitted. It is another form of plagiarism but considered less severe. There are no deterrents in place to detect its occurrence.²³

The reasons behind contract cheating are that the students are not satisfied with their learning procedures, English is not their mother-tongue, and there are ample opportunities to cheat.²² These contract cheating agencies offer appealing services like 24/7 support, refund to lure students. Bretag et al. (2020)²⁴ have highlighted the prevalence of contract cheating in Australian universities and non-university education providers. They concluded that the problem of contract cheating could be addressed by improving the teaching and learning environment; coordination and communication will minimize cheating and help in detecting if cheating has occurred. The faculty members need to understand that there is a relationship between the teaching and learning environment and students' use of contract services and modify the environment accordingly.

Though Rundle, Curtis, and Clare²⁵ have reported that a small number of students engage in contract cheating. Since the transactions are confidential in nature, the exact market size of the contract cheating is difficult to estimate.²⁶ The higher educational institutions do not employ efforts to map learners' abilities to their academic output. So, the misconduct of contract cheating remains unaddressed.

The inability of anti-plagiarism software to detect and the students' pressure to submit assignments and get good marks to create good opportunities for the essay mills to flourish. These agencies operate through social media-Facebook, Twitter, etc. The interactive nature of social media enables quick communication, collaboration and instant help to students who seek help from these essay mills.

Turnitin and Grammarly are not constructive in nature. The easy availability of information on the internet has led to the emergence of the concept of

'deplagiarism'. The students cut, copy, paste their contents and use these tools to deplagiarise their text. They do not get involved in the writing process; the students who handwrite an assignment before typing are more involved in the writing process. It implies that too much dependence on these tools mars the writing skills of the students.²⁷ Kaktins²⁸ has observed that the use of Turnitin is not effective in achieving the desired academic goals. The students consider its metrics more important and invest a lot of time for bringing down the similarity index rather than focusing on generating the work based on honesty. Though Dawson et al²⁹ have used alpha version of the Turnitin module, which investigates authorship by comparing students' submissions with their previous submissions. They have concluded that Turnitin may be used for addressing contract cheating.

These software are no panacea. These show false positives for common phrases, names of institutions, and references. These also give false negatives. These can't detect similarity if the content has been copied from sources that are not available in digital format.³⁰ The software do not determine plagiarism, but it scans work for identifying some text-similarity that may constitute plagiarism. Folytynek et al⁵ have compared 15 web-based text-matching systems used for detecting similarity. They used contents in 8 different languages from seven countries to evaluate the efficiency of systems on checking the single source and multi-source documents. The systems do not find all similar contents and at times flag innocuous content as plagiarized.

Reasons behind occurrences of plagiarism

The students cheat because there is a gap between what the students do as assignments and what they experience in the actual world of work. They consider that the assignments given to them are worthless. If the gap between what the students study and what they will be expected to do in the real world is filled, then the student will not engage in any of misconduct.³¹

Lack of self-control is one of the major predictors of all deviant behaviour, including academic misconduct. The students who lack self-control are more likely to engage in misconduct and look for such opportunities. Further, the ones who are involved more in leisure activities and spend less time in academic activities are more likely to engage in misconduct.³²

There are two major perspectives about the notion of plagiarism. In some cultures, learning is encouraged through writing and copying actual words, while the western notion does not accept copying the actual content verbatim. It is difficult to figure out if the students plagiarize because of their own cultural acceptance or lack of understanding of the western perspective of plagiarism. There is an association between the students' cultural background and their perception of plagiarism.³³ The novice writers, particularly students, researchers whose native language is not English, may lack requisite writing skills, or may be in the very rudimentary stage, and may require support from their teachers and supervisors. In some cultures, learning by rote and repetition are underlined.

There are various factors like lack of self-control, the pressure to achieve high marks, age, culture, gender, etc., which determine occurrences of plagiarism.³⁴ The perceptions towards plagiarism may differ from culture to culture depending upon how a discourse community understands and advocates. Maloshonok and Shmeleva³⁵ have surveyed 15159 undergraduate students from 8 Russian universities and found that the students cheated because they did not feel that dishonesty in education was objectionable. When the institutional integrity policies are not enforced, students are unaware of the gravity of the issue and consequences of infractions, there are no checks; they consider dishonesty as very innocuous and engage in it. Further, when they feel that it is more important to get good marks at any cost than developing actual skills and competence, they cheat. When the social comparisons are made and appearing competent and successful is more valued than being competent and successful, the element of dishonesty creeps in.³⁶

The malpractices are facilitated due to the emergence of outsourcing services, online resources, and repositories of teaching and learning content. The easy availability of ready-made information makes it easier for the students to indulge in misconduct or dishonest behaviour. It is a general perception that cheating is a victimless crime. It has also been observed that the faculty members are not trained, educators. The courses are not designed to mitigate student cheating. Further, the faculty members are not vigilant enough to identify, report and prevent occurrences of cheating.

The expertise and willingness of faculty members to identify misconduct and taking action is crucial to

stemming the rising tide of plagiarism. It has also been observed that assignments that are repeated across the courses make it easier for the students to cheat. The students also cheat when they perceive that assignments given to them are worthless with little or no educational value. Brimble³⁷ has observed that the inherent traits of a "modern life" influence faculty members and students; there are competing priorities, increase pressure to perform, and less commitment and inclination to teach and learn.

Though Ison³⁸ did not agree that easy availability of information led to plagiarism. The author used Turnitin to analyse 384 Ph. D dissertations written in US and Canada and found the mean similarity indices for pre-Internet and post-internet eras were 14.5 and 12.3%, respectively. The study concluded that the internet did not impact the occurrence of plagiarism in higher education.

Though the universities across the world have introduced plagiarism detection software, understanding of plagiarism through quizzes, by clearly putting in place policies and honour codes prevalent in higher education is important. Most students have admitted that they have engaged in some or the other form of plagiarism.³⁹ When students do not consider plagiarism as something wrong, they are more likely to plagiarize.⁴⁰

Inexperience and unawareness may be the contributing factors behind plagiarism. Lack of experience in writing, citing sources inappropriately may lead to instances of plagiarism.⁴¹ The psychology of the students determines their attitude towards plagiarism. The young male students have a more positive attitude towards plagiarism than the female and adult students. The negative emotionality and reduced positive effects are responsible for students' inclination towards plagiarism.⁴² The learning activities entail hard work, time, and financial resources. The pressure to succeed, heavy workload, strict timelines to meet, inability to persevere, may compel the students to cut corners; thus, they resort to cheating to maintain, sustain and survive.^{43, 24}

The tendency to procrastinate in academic activities leads to adverse outcomes. There is a need to deploy educational interventions to control academic procrastination.⁴⁴ Patrzek et al⁴⁵ have studied the responses of more than 1400 participants of different academic disciplines in 4 German universities to understand the effect of procrastination on the different forms of academic misconduct—fraudulent excuses, plagiarism, copying from others

in exams, using forbidden means in exams and falsifying or fabricating data. The academic procrastination caused all types of misconduct. It led to the enhanced use of fraudulent excuses.

To address the plagiarism menace, all stakeholders need to put in concerted efforts.⁴⁶ Honesty should be promoted in every aspect of academic life through orientation sessions, curriculum design, and professional development for staff and teachers. The staff, teachers, and students should know and understand the skills required for fulfilling the academic responsibilities.

The students plagiarize because they are not caught and reprimanded. Some students feel that even if they are caught, the penalty will be very nominal, so there is no harm in plagiarizing.⁴⁷ A small percentage of students engage in contract cheating, and the ones who do are likely to do it repeatedly, and opportunity is an important variable that leads to unethical behavior.⁴⁸

Dee and Jacob⁴⁹ mentioned that majority of the students are not aware of the meaning of academic integrity, and so when they violate the same in e-learning activities, they do not realize its gravity. Muhammad⁵⁰ examined the local environment in Saudi Arabia to perceive the status of academic integrity in e-learning and the measures to be adopted to discourage students from violating academic integrity.

Attitude of faculty and research scholars towards plagiarism

The students' perception and awareness about plagiarism may influence their decision to plagiarize. The students know about the concept of plagiarism but do not know what precisely constitutes plagiarism.^{51, 52} Their inability and incompetence to manage time and submit work by the deadlines also influences occurrences of plagiarism.⁵³

It has been observed that there is a gap between students perceptions towards plagiarism behaviour and their actual plagiaristic behavior¹⁷. But the instances of plagiarism are reduced when students are aware that anti-plagiarism software is in place and is being used. The author has underlined that there is no relationship between what students perceive about plagiarism and what they practice.

The students often do not read universities' policies for academic integrity and are not clear about the contents of policies for academic integrity. Gullifer and Tyson⁵⁴ surveyed 3405 students at an Australian

university and found that only 50% of them had read the university policy on plagiarism and lacked proper understanding. Uzun and Kilis⁵⁵ surveyed 588 university students to analyse the antecedents of plagiarism and found that attitude, information literacy, and moral obligation impacted their decision to engage in plagiarism.

When the students are educated about the integrity policies and what constitutes plagiarism, plagiarism occurrences go down. The interventions of plagiarism policies, their dissemination, online tutorial workshops, and the use of anti-plagiarism software help students handle stress and develop skills to manage time.⁵⁶

The faculty members who hail from a culture where there is equality irrespective of gender underscore the value of honesty in education and research. The faculty members in cultures of low power distance and high level of individualism consider their duty to teach students about the values of integrity.

Prevalence of plagiarism in different subjects

Farook et al⁵⁷ have highlighted the prevalence of plagiarism in dentistry. They have stressed that male authors and those who write in languages other than their mother tongue are highly likely to plagiarize. Scientific misconduct has been very commonly reported in medical writing despite robust peer-review procedures, careful statistical validation, and use of plagiarism and image-fraud detection software.⁵⁸

The problem of image manipulation is common in biomedical sciences, where images are used to depict laboratory results. Bucci⁵⁹ analysed 1364 published papers from PubMedCentral, from 451 journals and found that 6% of the published papers had manipulated images while 22% of papers had unacceptable images. Especially in medical sciences where human lives are involved, if integrity is compromised, the public may suffer because of recommendations of fraudulent research.⁶⁰ Eaton⁶¹, Lancaster and Clarke⁶² have reported instances of contract cheating in medical and health sciences.

Higgins, Lin, and Evans⁶³ used plagiarism detection software to study the extent of plagiarism in 400 manuscripts submitted to a medical journal. They found that 17% of manuscripts had unacceptable levels of plagiarized material, and 82% of the plagiarized manuscript were submitted from countries where English was the mother tongue.

Starovoytova and Namango⁴⁷, Halakand El-Hajjar⁶⁴, and Pawelczek⁶⁵ observed the prevalence of plagiarism

in engineering education. Plagiarism of source code is widespread; moreover, faculty members encourage students to use source code from various internet forums. Further, it is important for the students to understand others' source code for developing competencies for writing their own codes. Halak and El-Hajjar⁶⁴ have suggested that unique assignments should be given to the students, and they should be asked to present and discuss their coursework findings. These approaches will undoubtedly arrest the prevalence of plagiarism among the students.

Sattler, Wiegel, and Van Veen⁶⁶ have highlighted how 3655 faculty members from 55 disciplines at the universities in Germany used ten different methods to detect and prevent copying in exams, plagiarism, falsification, and fabrication of data. It has been observed that likelihood of academic dishonesty increases if prevention and detection methods are not used. Sun and Yang⁶⁷ have used Turnitin to analyse the paraphrasing ways, sources used, and instances of self-plagiarism in 71 journal articles in language and education. The authors used Turnitin and found that 30 different paraphrasing ways had been used; copying verbatim and substituting words was very common. The textual borrowing or self-plagiarism was also very high. Ababneh et al⁶⁸ have reported a lack of adequate knowledge and awareness about concepts of misconduct, including plagiarism among pharmacy undergraduate students.

Adverse effect of plagiarism

The misconduct of plagiarism has a detrimental effect on all stakeholders. It threatens the very existence and mission of the higher educational institutions. The instances of misconduct prevent them from confirming that their graduates are experts of subject areas and skills for which they have been certified.³² It leads to wastage of resources. Even when it is detected, it requires many efforts on the part of institutions, funding agencies to investigate the case and penalize the perpetrators. If it is left unaddressed, then the adverse effects are more harmful. The plagiarized research may slow studies and jeopardize patient safety in medical sciences. The perpetrators unduly receive research grants and career advancements, which they don't deserve. The funding bodies accept plagiarized papers as the outcome of research projects.

If the students get credit without doing any work, the extrinsic motivation for acquiring knowledge and competence is highly reduced. Similarly, the senior

researchers may earn accolades for some work that they have not done. Plagiarism is a major threat to scientific evidence accumulation, relying on the originality and transparency of scholarly publications. Elango, Kozak, and Rajendran⁶⁹ analysed reasons behind 239 retracted articles of Indian researchers, 195 from journals and 44 from conference volumes, published between 2005 and 2018 and found that plagiarism was the most frequent reason for retraction. The unwitting authors who survey the scholarly literature may cite or even plagiarize unethical publications before and after their retractions and may damage the credibility of current research reporting standards.⁷⁰

The all-pervasive corruption in education and research underplays and negates the very mission for which the higher educational institutions exist. If their landscape is rife with academic malafides, they lose public trust and esteem. The degrees which they confer on graduates can be looked upon with distrust and suspicion. The old habits of dishonesty are likely to die-hard and may continue with the researchers and maybe reflected in their behaviour as adults.

In the long run, widespread academic integrity aspect, when exposed by media, reduces the value of academic degrees and public support of higher education.⁷¹ Academic misconduct and plagiarism prevents internalization of norms of good scientific practices, general learning progression, and human capital acquisition.⁴⁶ Failure in learning increases the likelihood of failure in later professional life. Such behaviour may be transferred to other spheres of life-workplace deviance. Another downside of misconduct is that honest students may feel that they are at a loss compared to their peers who engage in dishonesty. They may lose motivation for their academic aspirations.

Tudoroiu⁷² underlines that plagiarism in education and research also threatens the values of democratic countries. There is degeneration of values, and corruption looms large in the societies. He analysed the cases of high-level public officials of Germany, Romania, Hungary, and Russia who indulged in plagiarism in their research work. The public trust eroded, resulting in the loss of law and order, and anarchy was all-pervasive.

Role of faculty members and library professionals

The need of the hour is to spread awareness and sensitize all stakeholders to all essential values which

need to be practiced in education and research. For facilitating a better understanding of concepts of different forms of misconduct, online integrity modules should be introduced.⁷³ The concepts of honesty and ethics should be stressed in education and research.

Ransome and Newton⁷⁴ analysed source text for the postgraduate certificate in higher education and found that concepts of academic integrity were not adequately covered. Sefcik, Striepe, and Yorke⁷⁵ have observed that the current academic education programmes lack comprehensive information on the values, disadvantages of outsourcing academic work. The programmes just focus on the plagiarism responsibilities of students and the use of proper referencing skills. The teachers need to play a proactive role in educating students about the proper conduct to be followed and ensuring compliance to integrity in education and research. They should not assume that their responsibilities are limited to imparting education in specific subject matter only.⁷⁶

Awareness should be imparted to all the students. If the students are aware, they will fare well and recommend severe penalties for infractions of integrity. In case they are not well-aware, they will lack confidence and expect their misconduct to be modestly penalized.⁷⁷ The students need to be taught about academic writing, inserting in-text citations and referencing.⁷⁸ Tan and Carnegie⁷⁹ have observed that interventions increase the pass rate of assessment from 56 to 80%. The students should have declarative and procedural knowledge. It means that the students should be able to identify that the written contents or texts have some problems and know how to correct them. Further, they should be offered education and training in ethics, morality, and literacy.⁵⁵

Conclusion

The study has reviewed literature related to misconduct of plagiarism in education and research. It is a global and cross-discipline problem. There are many reasons behind occurrences of plagiarism-students' ignorance about the issue, lack of motivation to perform and excel, desire to take shortcuts, among many others. There are antiplagiarism software available in the market and the higher educational institutions have mandated their use by the students and faculty members; the journals have also incorporated their use in their educational and peer review procedures.

The faculty members and library professionals should spread awareness and sensitize the students to the importance of adhering to honesty in education and research. The students should be aware of the various UGC regulations and policies which are in place for ensuring originality in education and research and the repercussions of not following them.

References

1. Tauginienė L, Gaižauskaitė I, Glendinning I, Kravjar J, Ojsteršek M, Ribeiro L, Odiņeca T, Marino F, Cosentino M, Sivasubramaniam S and Foltýnek T, Glossary for academic integrity, *Erasmus*, 1 (2018) 31.
2. Tripathi M, Dwivedi G and Babbar P, Policies and guidelines for academic misconduct in universities: a survey of the international landscape, In Satija M. P, Martinez-Avila, S and Swain, N K (Eds.) *Plagiarism: an international reader*, (Ess Ess Publishers: New Delhi), 2019, p.183-200.
3. Stolowy H, Letter from the Editor: why are papers desk rejected at European accounting review? *European Accounting Review*, 26 (2017) 3. <https://doi.org/10.1080/09638180.2017.1347360>
4. Campos-Varela I, Villaverde-Castañeda R and Ruano-Raviña A, Retraction of publications: a study of biomedical journals retracting publications based on impact factor and journal category, *Gaceta sanitaria*, 34 (5) (2020) 430-434.
5. Foltýnek T, Meuschke N and Gipp, B, Academic plagiarism detection: a systematic literature review, *ACM Computing Surveys (CSUR)*, 52 (6) (2019). DOI: <https://doi.org/10.1145/3345317>
6. Teh E C and Paull M, Reducing the prevalence of plagiarism: a model for staff, students and universities, *Issues in Educational Research*, 23 (2) (2013) 283-298.
7. University Grants Commission (Promotion of Academic Integrity and Prevention of Plagiarism in Higher Educational Institutions), (2018). Available at https://www.ugc.ac.in/pdfnews/7771545_academic-integrity-Regulation2018.pdf (Accessed on 20 Oct 2020)
8. UGC Good Academic Research Practices, (2020). Available at https://www.ugc.ac.in/e-book/UGC_GARP_2020_Good%20Academic%20Research%20Practices.pdf (Accessed on 20 Oct 2020)
9. UGC, Research and Publication Ethics. (2019). Available at https://www.ugc.ac.in/pdfnews/9836633_Research-and-Publication-Ethics.pdf (Accessed on 20 Oct 2020.)
10. Tertiary Education Quality and Standards Agency TEQSA(2020), Available at <https://www.teqsa.gov.au/protecting-academic-integrity> (Accessed on 20 Oct 2020)
11. Moher D, Bouter L, Kleinert S, Glasziou P, Sham M H, Barbour V, Coriat A, Foeger N and Dirnagl U, The Hong Kong principles for assessing researchers: fostering research integrity, *PLoS Biology*, 18(7) (2020) e3000737. <https://doi.org/10.1371/journal.pbio.3000737>
12. https://main.icmr.nic.in/sites/default/files/upload_documents/ICMR_policy_ripe.pdf (Accessed on 02 Apr 2021).
13. Memon A R and Mavrincac M, Knowledge, attitudes, and practices of plagiarism as reported by participants completing the AuthorAID MOOC on research writing, *Science and Engineering Ethics*, 26 (2020) 1067-1088.

14. Garg U and Goyal V, Maulik: A plagiarism detection tool for Hindi documents. *Indian Journal of Science and Technology*, 9 (12) (2016). DOI: 10.17485/ijst/2016/v9i12/86631.
15. Bruton S and Childers D, The ethics and politics of policing plagiarism: a qualitative study of faculty views on student plagiarism and Turnitin, *Assessment & Evaluation in Higher Education*, 41 (2016) 2.
16. Belli S, Raventós C L and Guarda T, Plagiarism Detection in the F: Honesty and Trust through the Urkund and Turnitin Software. In Rocha Á, Ferrás C, Montenegro Marin C and Medina García V. (Eds.) *Information Technology and Systems, Advances in Intelligent Systems and Computing*, (Springer; Cham), 2020, p. 1137 https://doi.org/10.1007/978-3-030-40690-5_63
17. Shang H F, An investigation of plagiarism software use and awareness training on English as a foreign language (EFL) students. *Journal of Computing in Higher Education*, 31 (1) (2019)105-120.
18. Chien S C, Cultural constructions of plagiarism in student writing: teachers' perceptions and responses, *Research in the Teaching of English*, 49 (2) (2014) 120-140.
19. Mphahlele A and Mckenna S, The use of Turnitin in the higher education sector: decoding the myth. *Assessment & Evaluation in Higher Education*, 44 (7) (2019) 1079–1089 <https://doi.org/10.1080/02602938.2019.1573971>
20. Kunschak C, Multiple uses of anti-plagiarism software, *The Asian journal of applied linguistics*, 5 (1) (2018).
21. Tierney W G and Almeida D J, Academic responsibility: toward a cultural politics of integrity, *Discourse: Studies in the Cultural Politics of Education*, 38 (1) (2017) 97-108.
22. Bretag T, Harper R, Burton M, Ellis C, Newton P, Rozenberg P, Saddiqui S and van Haeringen K, Contract cheating: a survey of Australian University students, *Studies in Higher Education*, 44 (11) (2019) 1837-1856.
23. Lines L, Substantive editing as a form of plagiarism among postgraduate students in Australia, *Assessment & Evaluation in Higher Education*, 41(3) (2016) 368-383.
24. Bretag T, Harper R, Rundle K, Newton P M, Ellis C, Saddiqui S and van Haeringen K, Contract cheating in Australian higher education: a comparison of non-university higher education providers and universities, *Assessment & Evaluation in Higher Education*, 45 (1) (2020)125-139
25. Rundle K, Curtis G J and Clare J, Why students do not engage in contract cheating, *Frontiers in Psychology*, 10 (2229) (2019).
26. Amigud A and Lancaster T, 246 reasons to cheat: an analysis of students' reasons for seeking to outsource academic work, *Computers & Education*, 134 (2019) 98-107.
27. Wrigley S, Avoiding 'de-plagiarism': exploring the affordances of handwriting in the essay-writing process, *Active Learning in Higher Education*, 20 (2) (2019) 167-179.
28. Kaktiņš L, Does Turnitin support the development of international students' academic integrity? *Ethics and Education*, 14 (4) (2019) 430-448.
29. Dawson P, Sutherland-Smith W and Ricksen M, Can software improve marker accuracy at detecting contract cheating? A pilot study of the Turnitin authorship investigate alpha, *Assessment & Evaluation in Higher Education*, 45 (4) (2020) 473-482.
30. Weber-Wulff D, Plagiarism detectors are a crutch, and a problem, *Nature*, 567 (7749) (2019) 435. Doi: 10.1038/d41586-019-00893-5.
31. Sotiriadou P, Logan D, Daly A and Guest R, The role of authentic assessment to preserve academic integrity and promote skill development and employability, *Studies in Higher Education*, 45 (11) (2020) 2132-2148.
32. Yu H, Glanzer P L, Johnson B R, Sriram R and Moore B, Why college students cheat: a conceptual model of five factors, *The Review of Higher Education*, 41 (4) (2018) 549-576.
33. Kasler J, Zysberg L and Gal R, Culture, collectivism-individualism and college student plagiarism, *Ethics and Behavior*, (2020) 1-10.
34. Tremayne K and Curtis G J, Attitudes and understanding are only part of the story: self-control, age and self-imposed pressure predict plagiarism over and above perceptions of seriousness and understanding, *Assessment & Evaluation in Higher Education*, 46 (2) (2021) 208-219. DOI: 10.1080/02602938.2020.1764907
35. Maloshonok N and Shmeleva E, Factors influencing academic dishonesty among undergraduate students at Russian universities, *Journal of Academic Ethics*, 17 (3) (2019) 313-329.
36. Anderman E M and Koenka A C, The relation between academic motivation and cheating, *Theory Into Practice*, 56 (2) (2017) 95-102
37. Brimble M, Why students cheat: an exploration of the motivators of student academic dishonesty in higher education, *Handbook of academic integrity*, 365 (2016).
38. Ison D C, The influence of the internet on plagiarism among doctoral dissertations: an empirical study, *Journal of Academic Ethics*, 13 (2015) 151–166. <https://doi.org/10.1007/s10805-015-9233-7>
39. Curtis G J and Tremayne K, Is plagiarism really on the rise? Results from four 5-yearly surveys, *Studies in Higher Education*, (2019) 1–11. Doi:10.1080/03075079.2019.1707792.
40. Husain F M, Al-Shaibani G K S and Mahfoodh, O H A, Perceptions of and attitudes toward plagiarism and factors contributing to plagiarism: a review of studies, *Journal of Academic Ethics*, 15 (2) (2017) 167-195.
41. Chankova M, Dealing with Students' Plagiarism pre-emptively through teaching proper information exploitation, *International Journal for the Scholarship of Teaching and Learning*, 11 (2) (2017).
42. Tindall I K and Curtis G J, Negative emotionality predicts attitude toward plagiarism, *Journal of Academic Ethics*, 18 (1) (2020) 89-102.
43. Lewellyn P G and Rodriguez L C, Does academic dishonesty relate to fraud theory? a comparative analysis, *American International Journal of Contemporary Research*, 5 (3) (2015) 1-6
44. Goroshit M, Academic procrastination and academic performance: an initial basis for intervention, *Journal of prevention & intervention in the community*, 46 (2) (2018) 131-142.
45. Patrzek J, Sattler S , van Veen F, Grunschel C and Fries S, Investigating the effect of academic procrastination on the frequency and variety of academic misconduct: a panel study, *Studies in Higher Education*, 40 (6) (2015) 1014-1029.
46. Bretag T, Challenges in addressing plagiarism in education, *PLoS Med*, 10 (12) (2013). <https://doi.org/10.1371/journal.pmed.1001574>

47. Starovoytova D and Namango S S, Viewpoint of undergraduate engineering students on plagiarism, *Journal of Education and Practice*, 7(31) (2016) 48-65.
48. Curtis G J and Clare J, How prevalent is contract cheating and to what extent are students repeat offenders? *Journal of Academic Ethics*, 15 (2) (2017) 115–124. Doi:10.1007/s10805-017-9278-x.
49. Dee T S and Jacob B A, Rational ignorance in education a field experiment in student plagiarism, *Journal of Human Resources*, 47(2) (2012) 397-434.
50. Muhammad A, Shaikh A, Naveed Q N and Qureshi M R N, Factors affecting academic integrity in E-learning of Saudi Arabian Universities. An investigation using Delphi and AHP, *IEEE Access*, 8 (2020) 16259-16268.
51. Cosma G, Joy M, Sinclair J, Andreou M, Zhang D, Cook B and Boyatt R, Perceptual comparison of source-code plagiarism within students from UK, China, and South Cyprus higher education institutions, *ACM Transactions on Computing Education*, 17(2) (2017) 1. Doi: 10.1145/3059871
52. Bruton A and Childers D, The ethics and politics of policing plagiarism: a qualitative study of faculty views on student plagiarism and turnitin, *Assessment & Evaluation in Higher Education*, 41(2) (2016) 316–330. Doi: 10.1080/02602938.2015.1008981
53. Adam L, Anderson V and Spronken-Smith R, It's Not Fair: policy, discourses and students' understandings of plagiarism in a New Zealand University, *Higher Education*, 74(1) (2017) 17–32. doi: 10.1007/s10734-016-0025-9
54. Gullifer J M and Tyson G A, Who has read the policy on plagiarism? unpacking students' understanding of plagiarism, *Studies in Higher Education*, 39 (2014) 7. <https://doi.org/10.1080/03075079.2013.777412>
55. Uzun A M and Kilis S, Investigating antecedents of plagiarism using extended theory of planned behavior, *Computers & Education*, 144 (2020) 103700.
56. Mahmoud M A, Mahfoud Z R, Ho M J and Shatzer J, Faculty perceptions of student plagiarism and interventions to tackle it: a multiphase mixed-methods study in Qatar, *BMC Medical Education*, 20(1) (2020) 1-7.
57. Farook T H, Radford J, Alam M K and Jamayet N B, Plagiarism in dentistry-a systematic review, *British Dental Journal*, (2020) 1-7. <https://doi.org/10.1038/s41415-020-2026-4>
58. Mavrogenis A F, Panagopoulos G N, Megaloikonomos P D, Panagopoulos V N, Mauffrey C, Quaile A, and Scarlat M M, Scientific misconduct (fraud) in medical writing, *Orthopedics*, 41(2) (2018) e176-e183.
59. Bucci E M, Automatic detection of image manipulations in the biomedical literature, *Cell Death Dis*, 9 (2018) 400. <https://doi.org/10.1038/s41419-018-0430-3>
60. Khadiikar S S, Scientific misconduct: a global concern, *The Journal of Obstetrics and Gynecology of India*, 68 (2018) 331–33.
61. Eaton S E, The ethics of outsourcing: contract cheating in medicine and health sciences, (2019). In *Proceedings of the paper presented at the Orthopaedic Surgery Citywide Rounds*, Calgary, Canada.
62. Lancaster T and Clarke R, Examining contract cheating, essay mill use and academic misconduct by students on health courses, (2015). https://www.researchgate.net/profile/Thomas-Lancaster-2/publication/323425525_Examining_Contract_Cheating_Essay_Mill_Use_and_Academic_Misconduct_by_Students_on_Health_Courses/links/5a956d4daca27214056920dd/Examining-Contract-Cheating-Essay-Mill-Use-and-Academic-Misconduct-by-Students-on-Health-Courses.pdf (Accessed on 02 Apr 2021).
63. Higgins J R, Lin F and Evans J P, Plagiarism in submitted manuscripts: incidence, characteristics and optimization of screening—case study in a major specialty medical journal, *Research Integrity and Peer Review*, 1 (2016) 13. <https://doi.org/10.1186/s41073-016-0021-8>
64. Halak B and El-Hajjar M, Design and evaluation of plagiarism prevention and detection techniques in engineering education, *Higher Education Pedagogies*, 4 (1) (2019) 197-208.
65. Pawelczak D, Benefits and drawbacks of source code plagiarism detection in engineering education. In *2018 IEEE Global Engineering Education Conference (EDUCON)*, (IEEE), p. 1048-1056.
66. Sattler S, Wiegel C and Veen F V, The use frequency of 10 different methods for preventing and detecting academic dishonesty and the factors influencing their use, *Studies in Higher Education*, 42 (6) (2017) 1126-1144.
67. Sun Y C and Yang F Y, Uncovering published authors' text-borrowing practices: paraphrasing strategies, sources, and self-plagiarism, *Journal of English for Academic Purposes*, 20 (2015) 224-236.
68. Ababneh R. A, Alzoubi K H and Ababneh M A, Evaluation of Pharmacy Students' Knowledge and Perception of Scientific Integrity, *Education Sciences*, 10 (2) (2020) 41.
69. Elango B, Kozak M and Rajendran P, Analysis of retractions in Indian science, *Scientometrics*, 119 (2) (2019) 1081-1094.
70. Gasparyan A Y, Nurmashev B, Seksenbayev B, Trukhachev V I, Kostyukova E I and Kitaz G D, Plagiarism in the context of education and evolving detection strategies, *Journal of Korean medical science*, 32 (8) (2017) 1220-1227.
71. Bretag T, The rise of contract cheating in higher education: academic fraud beyond plagiarism, *International Journal for Educational Integrity*, 14 (2017) 10. <https://www.biomedcentral.com/collections/cche>
72. Tudoroiu T, No, Prime Minister: PhD plagiarism of high level public officials, *European Review*, 25 (4) (2017) 623-641.
73. Maio D C, Dixon K and Yeo S, Academic staff responses to student plagiarism in universities: a literature review from 1990 to 2019, *Issues in Educational Research*, 29 (4) (2019) 1131
74. Ransome J and Newton P M, Are we educating educators about academic integrity? a study of UK higher education textbooks, *Assessment & Evaluation in Higher Education*, 43 (1) (2018) 126-137.
75. Sefcik L, Striepe M and Yorke J, Mapping the landscape of academic integrity education programs: what approaches are effective? *Assessment & Evaluation in Higher Education*, 45 (1) (2020) 30-43.
76. Zaring O, Gifford E and McKelvey M, Strategic choices in the design of entrepreneurship education: an explorative study of Swedish higher education institutions, *Studies in Higher Education*, 46 (2) (2019) 1-16.

77. Newton P, Academic integrity: a quantitative study of confidence and understanding in students at the start of their higher education, *Assessment & Evaluation in Higher Education*, 41(3) (2016) 482-497.
78. Du Y, Evaluation of Intervention on Chinese Graduate Students' Understanding of Textual Plagiarism and Skills at Source Referencing. *Assessment & Evaluation in Higher Education*, 45 (1) (2020) 14–29. Doi:10.1080/02602938.2019.1601680
79. Tan E and Carnegie S, It's not plagiarism; it's a bad use of power phrasing: assessment of home and international student (mis)understandings of citation practice, *Innovations in Education and Teaching International*, (2020). DOI: 10.1080/14703297.2020.1844779 (Accessed on 04 Apr 2021)