

CONTEMPORARY ISSUES IN PROFESSIONAL ETHICS



EDITED BY

ADUKE ADEBAYO

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CHAPTER TEN

SCIENCE AND ETHICS

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INTRODUCTION

It is imperative to illuminate on the subject of ethics as defined by different authorities. Ijeoma (2001) narrowly defined ethics as the rules or standard conduct for members of a profession, while Fleet (1991) as quoted by Ijeoma (2001) defined ethics as "those standards or morals a person sets for himself or herself regarding what is good and bad or right and wrong". Ethics in science are closely related to issues concerning objective conduct and advancement of science for the benefits of humans. The philosophy of science is expressed in the characteristics of science, which include specificity, availability in the public domain, impersonal and objectivity (Aigbodioh, 1997). Steps in the identification, conduct of research, gathering and analysis of data, and the publication of results or information are conscientiously guarded and protected by established code of conduct. When such code of conduct is violated or impinged upon then the rationale for science as custodian for upholding the truth becomes questionable and in doubt. There are, however, sanctions for violating these ethics.

In this write up, we have not attempted to go into academic furore of distinguishing between the fundamentals of social and pure sciences. However, these two noble fields of science are premised on the same principles and mostly there is overlap in the ethics governing the conduct and application of these sciences.

The establishment of truth proved beyond all reasonable doubt, its use and availability of it in the public domain for scrutiny are of major concern. Discovery of truth should not base on flimsy or encumbered by emotional or unscientific practices. Establishment of truth is fundamental in the

advancement of science. It may however, be argued that what is perceived as truth may become jettisoned if new discoveries showed the contrary. Many cases abound in science where truth as established previously become relegated once new facts emerged to confirm that new facts are superior to earlier claims. The scientist should not be disturbed by this, but should use it as an advantage for the attainment of strength and not weakness. A fundamental debate remains unsettled as to what is the 'truth.' The pursuit of knowledge remains pristine and should not be adulterated by researchers.

Irrespective of procedure, the concretization of a science of ethics is the ultimate and the most urgent requirement for human advancement. The absence of science of ethics is reflection of a general melee permeating the scientific realm of the human race. The gamut of scientific data gathered need to be empirically sifted and tested for a visionary and relevance to the scientific world. Contemporary ethical structures anchored on non-pragmatically experimented initiatives do offer database for discourse.

It is high time the issue of science and ethics took preeminence in Nigeria. Many other countries of the world are already taking a lead while a few others only need updating. It is important for a wave of it to take firm root in the present day Nigeria due to the scanty reports of misconducts in newspapers. Possibly, we should pause and reason whether scientists in Nigeria actually necessitate specialized code of conduct. In our minds, we think that the best way to deal with a subject like this is to echo the philosophy of science and ethics itself. The linker between science and ethics is x-raying of the conduct and protection of the researcher, the research subjects and the community as a whole.

We attempt to discuss ethical issues that emanate at the various stages of research process from conceptualization of research ideas to eventual transfer of the research outcomes (results) to public domain.

CONDUCT AND MISCONDUCT IN SCIENTIFIC RESEARCH

In scientific research, as it occurs in other disciplines, there are guiding principles that characterize the formulation of hypothesis, design of experiment, identification of protocol to follow, collection of data, statistical analysis, validation of results and discussion and list of bibliography. In this section, our discussion will x-ray conduct and misconduct before research, during research, after research, during peer-review and after publication. Olayinka (2006) described the research process from ideation to proofs (Figure 1).

BEFORE RESEARCH

The Process of Research

Conduct of research is an essential integral part of the tertiary education. Research contributes to the teaching-learning process, and without research, the process of advancement slows down or completely halts. The research process essentially involves problem identification, development hypotheses, experimental design, collection and analysis of data, communication of findings with others, review and critiques the results of peers, training and supervision of associates and students. Societal forces ideally drive the research process, and scientific research cannot be successfully initiated and executable without drawing on the experiences of other scientists. Scientific findings move into public domain only after they are presented to others for peer reviewing. to declare that there is no positive association between smoking and **Sponsorship of scientific research and conflict of interest**

Even though in Nigeria, private sector participation in the funding of scientific research is limited, scientists may be forced to dance to the tune of the sponsors by producing 'tele-guided results' that support the company's interest. For example, a tobacco company that sponsors research on smoking and development of lung cancer may pressurize the researcher cancer-development in the individuals.

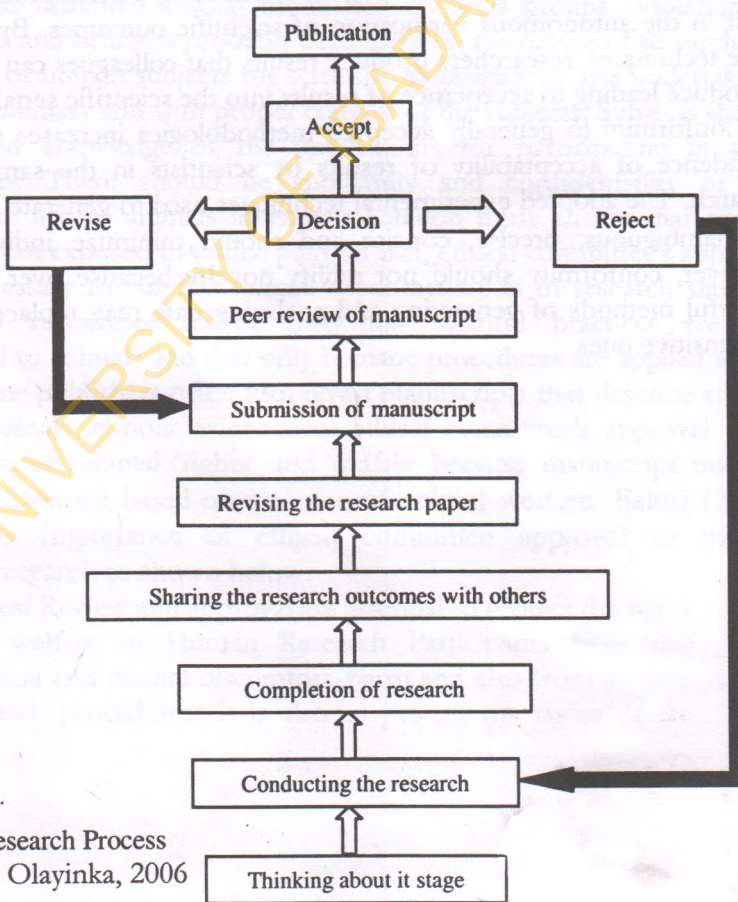


Fig 1: The Research Process
Source: Olayinka, 2006

Adetimirin (2005) reported a paper published in 1996 in *Annals of Internal Medicine* where 98% of papers based on industry-sponsored research reflected favourably on drugs being tested compared to 79% of papers based on research not funded by industry. In order to remain relevant, scientists may indulge in such unethical practices. Scientists who indulge in such unwholesome venture are mortgaging and subverting their integrity for truth. Ownership of shares or other financial interest in a named company might also lead to bias in scientific decisions affecting the survival or development of the company. Research proposals that often conflict with researchers interest, most of the time, do not get funding from the private sector.

DURING RESEARCH

Application of research methodologies

Inappropriate research methodologies result in questionable, unclear and ill-defined outcomes. The ultimate goal of choosing correct procedures is to assist in the autonomous verification of scientific outcomes. By sticking to these techniques, researchers produce results that colleagues can more easily reproduce leading to acceptance of results into the scientific serial.

Conformity to generally accepted methodologies increases the level of confidence of acceptability of results by scientists in the same realm of research. The adopted experimental techniques used to generate data should be unambiguous, precise, concise and should minimize individual bias. However, conformity should not nullify novelty because over time more powerful methods of generating and analyzing data may replace weak and less sensitive ones.

Moreover, some researchers are known to try to force the outcome of their investigations to conform to expected outcomes. It is an unacceptable scientific conduct to claim to have used a particular methodology when in reality it was not used. Statistical methods have been designed, when used correctly, minimize bias and produce unambiguous results.

The nature of research conducted

The extent of forage of research is very often not defined. Generally, research seeks better, simpler, easier, cheaper, less risky and time saving ways of doing things for the benefit of humans. However, will it be unethical to sponsor research that borders on production of defence and destruction weapons for of human lives? No other issues have generated much debate in recent times as the issues of abortion, blood transfusion, manipulation of childbirth delivery dates, embryonic stem cell research, genetically modified organisms (GMOs) and human cloning. These controversial debates on such issues appear unsettled among moral and religious groups. Violation of ethical values and beliefs is probably dependent on the nature of research.

The use of human subjects for scientific investigations and undertakings should be voluntary and with proper consent of the subjects. Subjects should have detailed knowledge of the implications for participating in such investigations. There should be anonymity and confidentiality of the subjects. The use of animals in experimentation must ensure that animal subjects are not exposed to undue pain. In fact, ethical committee's approval is often necessary to conduct animal experimentation in research stations. The ethical committee makes sure that harmful practices are not administered to animals and that only humane procedures are applied to the animals. Some publishers often turn down manuscripts that describe studies involving animals without evidence of ethical committee's approval. This issue borders on animal 'rights' and welfare because manuscript may be rejected by a journal based on violation of animal welfare. Falusi (2005) reported the importance of ethical committee approval in human participant research as shown below.

Ethical Review and approval are essential to protect the rights and welfare of Human Research Participants from any physical and mental discomfort, harm and also from adverse research procedures. It is also to protect the rights of the

researcher to carry out legitimate investigations. It helps to protect the University's reputation for research conducted and negligence made against researchers and the University.

It provides supporting evidence for Journal Publication.

Experiments involving the use of radioactive materials are conducted after permission is sort from International Atomic Energy Agency (IAEA) or other similar organizations. Moreover, the disposal of used potentially hazardous chemicals should be disposed of according to stipulated regulations, while users of such reagents need adequate protection from exposure to poisoning.

Conscious fraudulence in science

It is rather disheartening and unbelievable that scientists would indulge in purposeful deceitfulness. This is true and it is becoming rampant in the society. Any published scientific work that cannot be reproduced by other researchers after many attempts of thorough scrutiny, may probably emanated from deliberate manipulation. Deliberate manipulation is a fraudulent practice that may include forgery, fabrication, falsification, fiddling and plagiarism of data in an attempt to get undue honour and admiration from the academia and the larger society.

Calculated deceptions stem from 'doctoring' of results by garnishing and manufacturing. Garnishing and manufacturing are deliberate systems of purifying a stained data through 'panel beating'. Some institutions and federal agencies abroad adopt policies that limit the number of peer-reviewed publications necessary for commendation, appointment, promotion and funding. The "publish or perish" syndrome drives many a scientist into unethical practices, but this is not an excuse for indulging in dubious practices.

Openness and collaboration in science

Science is not only an individual experience but also a collective aspiration. It is shared knowledge based on a common understanding of some aspects of the physical or social world. For that reason, the social conventions of science play an important role in establishing the reliability of scientific knowledge. If these conventions are disrupted, the quality of science suffers.

Collaboration is important in the conduct of research. Emphasis is now on interdisciplinary and multidisciplinary research. In the field of science, it is almost impossible for a scientist to work and publish in isolation. Collaboration with different scientists within and outside one's institution enables one to discover new areas of research and development

leading to landmark research. Ethics in science generally stipulates that researchers have substantial freedom of mutually choosing what to explore and in selecting how to systematize specialized and personal experiences. Scientists are in the best position to decide on who to work with and when and where to exchange information. In fact, much of the knowledge and skills needed to make tangible choices in science come through inter-personal discourse and expositions with other scientists. Science has become a much more collaborative enterprise than it was in the past, giving room for more opportunities in multi-disciplinary and inter disciplinary research in different locations.

Some Nigerian academic institutions place emphasis on sole-authorship, a trend that is antithetic to modern scientific research. Collaboration is almost inevitable in science research. Individualism in the conduct of research and the syndrome for single authorship in publication might not be far from academic fraud and plagiarism. Science is dynamic and multifaceted, and therefore, it is seemingly unfair to painstakingly emphasise sole authorship in scientific publications as basis for promotion and appointment.

Clarification of facts in Science

This aspect of our discussion centres on experimental procedures and the management of data. The target of techniques is to ease the sovereign authentication of scientific observation. By sticking to the methodologies, investigators generate results that others can more effortlessly repeat, which endorses the recognition of the results into the scientific harmony. Apart from validity of data, the method of data analysis employed is equally important. Application of appropriate methodologies for data collection, analysis and interpretation are important in science.

Citation, authorship allocation of credits in scientific publications

In an acceptable scientific paper, correct citation of references is essential, and occurs in the list of authors, in the acknowledgement of assistance from others, and in the bibliography. Acknowledgement and citations are parts of the reward system in science as recognized scientists are accorded proper credit in their research endeavours. Correct citations in a scientific paper aim at; (i) acknowledgement of the contributions of other scientists, (ii) giving additional source of information to readers (iii) showing discrepancies in results of similar or near-similar studies that have been earlier conducted. Researchers who routinely fail to acknowledge the works of fellow scientists risk exclusion because of their unhelpful and secretive postures.

In science, multiple-authorship is common, unlike in some disciplines. The research process in science is often more collaborative in nature, and ideally the order in which the names appear in a publication should depend on the degree of contribution of each author to the research process. The order is often a subject for debate because cases abound whenever craving for single authorship drives scientists to publish their students' work without including the names of the students who carried out the work. This is certainly unethical and should be discouraged.

In addition, occasionally, a name may be part of the list of authors even though that person had insignificant contribution or nothing to do with the content of a paper. This practice undermines the credit due to the people who actually conducted the research, while it bolstered credentials or egos of the "invited author".

In the Nigerian situation, the earlier a name appears in the roll of authors, the greater the contribution. This has created some 'bad blood' in multiple authorship publications, and the unbridled quest for single authorship at all cost.

To avoid conflict of scientists over the sharing of credits, it is vital that the issue of division of credit be settled among the investigators right from the formative stage of the research. Even though there is no universally acceptable norm for sharing credits, the best convention should apply with respect to peculiar situation where investigators are aware of their rights, privileges and obligations.

AFTER RESEARCH

Publicising research with findings

Laxity in science is synonymous to indolence and it could be termed as negligence. From whatever angle one may view this word, it points to a kind of paramount misconduct in science. There is an accepted procedure to trail when, where and how information about a scientific discovery is to be passed to the public. Submission to a scholarly peer-reviewed journal is the normal route for the scientists to present the investigational tactics and amassed data for scrutiny and eventual publication, if found acceptable. It is unethical to announce such findings on the radio and in the newspaper without undergoing a proper peer-review process. Some desperate scientists contravene the laid down rules by suddenly instituting impromptu journals in an attempt to publish at all cost. By sloppiness of some other scientists, they distribute magazines, leaflets and booklets to create awareness of their findings. By this development, one can hardly be convinced that errors will not be spreading like wildfire.

Rating of academic publications based on impact factor scale may help discourage the submission of manuscripts to sub-standard science journals. The dismal performances of Nigerian journals were reported in a study conducted by Nigerian University Commission (NUC). The report as appeared in *The Guardian* of 4th July 2005 quoted by Adebayo (2005) showed that out of 138 journals submitted for assessment only four met international standard (being 2.8%), ten were of prospective international standard, (being 7.2%); 68 (being 80.2%), were of local standard while 11 (8%) met super local standard. A possible reason for hasty scientific publication in our society is for promotion and perhaps precedence for discovery. We propose that there should be strict guidelines for operation of academic journals in the society. For example, every science-based department should have thorough knowledge and review of scientific information going out of its domain before making it known to the public. One of the ways to do this is through a well-screened seminar presentation and setting up of a standing committee that will evaluate genuineness of scientific manuscripts. However, unethical situation may arise from this practice, where the faculty frustrates the scientist by unnecessary and prolonged delay, or not approving manuscript for submission in a journal, even when the manuscript has scientific merit.

The peer review process

Peer-reviewing (refereeing) is a major component of research that begins the publication of research works for science journals. All journals have their in-house style for conducting a review process. Peer review subjects the manuscripts to search light or scrutiny by others who are (often) subject matter specialists in the discipline. The essence of peer review process is to achieve mainly standardization in the scientific discipline. Articles that have not undergone peer review are most of the time received with suspicion, disdain and are underrated by professional colleagues. The peer review process is vital and critical to the establishment and advancement of science and therefore, the process should be conducted without bias. It is unethical for a peer-reviewed journal to publish articles without subjecting them to the normal review process. We recognize that colleagues in the same discipline as the authors should be arbitrator and ultimate source of reference for monitoring, accepting or rejecting the manuscripts. In as much as peer review is a *sine qua non* for researchers, the process is sometimes fraught with deficiencies.

Some problems in the peer review process

Some editors sometimes deliberately send articles to friends, academic mentors or former students who may not be down-to-earth in the review of such manuscripts. At times, reviewers' bias may influence the review process especially if ideas to be published are against the views and opinions held by the reviewers. To reduce conflict of interest or biasness and to introduce fairness, choosing of reviewers should be with anonymity. Anonymity and independent opinion is important in peer review process. However, some journals encourage the disclosure of the identities of the reviewers. In our society such may lead to acrimony between the authors and reviewers, especially if the reviewer(s) turns down the reviewed paper.

Anonymity of the authors who submitted manuscripts is also important and processes for doing this include double-blind or *double-masked* review in which the authors are requested to expunge any reference that may be suggestive of their identities. In *double-blind* review, the names of the author is removed from the title page of the paper and in the reference list, should the name occur in such a frequency as to suggest the author of the manuscript. Some authors deliberately pad their reference lists with some of their past publications, which may seemingly bear little or no relevance to the present articles. This is fraudulent and unacceptable in science.

There are times when difficulties arise in the selection of reviewers for novel ideas that involve groundbreaking research (trailblazers). Manuscripts of such research may lack general understanding and therefore, seemingly difficult to review.

Some reviewers do not submit their reports on time because of too much academic workload or otherwise. The review process can be slow, and may take several months or years for a submitted paper to appear in print. Some of the delays may come from the reviewers who because of heavy academic engagements may not find time to review such papers on time. Moreover, reviewers are not often remunerated. Should reviewers be remunerated? If yes, how? The answer to the question is debatable!

Some reviewers may be too critical in their assessment of manuscripts and they *ab initio* hold the opinion of outright rejection of the manuscript. Lee (1995) reported a generally acceptable way of conducting a review process. This article we have found also applicable to review of science manuscripts.

In some situations, reviewers have been reported to require the author to include a reference to their own (the reviewer's) work before they will

approve the manuscript for publication. This is an unethical practice and should be discouraged, and such a reviewer should be disallowed from further review of the particular manuscript. In fact, some journals have a clear-cut policy guideline that encourages authors to report such conflict of interest.

Pirating the title of an article

Reviewers who turn down the publication of article and in turn write a manuscript incorporating ideas from the turned down manuscript have committed piracy, and may be investigated. It is however, ethical for a reviewer to submit an opposite view proposal for a rejected manuscript because he thought the investigator was wrong. In this case, the reviewer has not stolen the idea of the original author; his idea is in fact, opposite to the original one.

Blocking of publications for invalid and non scientific reasons

For reasons bordering on unbridled rivalry and jealousy, sometimes reviewers block publication of scientific articles especially if the results are at variance with their opinions. For example, there was the case of a Nobel laureate who confessed that he blocked a publication in several journals of a certain measurement that was in disagreement with the values he had published, but only for the paper to be published in a journal for which he had no control over. Today the blocked measurements are the values accepted by most people in the field. This practice by the Nobel laureate was clearly unethical. Scientists should be fair enough to accommodate opposing views.

Pettifogging over trivial issues

Some reviewers have the tendency to heckle authors about minor, flimsy and inconsequential points in manuscripts. Moreover, no author likes to be beleaguered unnecessarily over trivialities and therefore will choose a journal based on the integrity, adequacy and fairness of its reviews, avoiding so-called top-rated journals that delay publication and even reject publications for reasons that have little to do with faulty methodology or strange communication of the research.

Failing to respond to enquiries from authors

It is certainly discourteous to authors if no response or acknowledgement is made concerning their manuscripts. The long delay or lack of response may indicate that something unethical is taking place. The process of review should be timely since such delays prevent authors from submitting the articles to other journals for consideration. A delay in this regard is tortuous to a budding author, as every editor knows what it is like to wait for the outcome of a review manuscript, which takes too long. This is especially

discouraging and may delay the author from proceeding in his research and promotion. Again, this is not so much unethical as it is discourteous behavior. Loss of manuscripts without apology and an appeal for resubmission by the reviewers bothers in the sphere of unethical practice. This act portrays lack of sensitivity and outright discourtesy.

Deleting portions of a manuscript without consultation

Copy editors may delete portions of a manuscript where necessary, but this should be with consent of the author. However, when editors do the contrary, it is unwholesome and therefore, should be discouraged, especially if a substantial part of the manuscript is considered for deletion. It is more apparent in science as replacement of a single word or altering a symbol may radically distort the meaning of the entire sentence.

The onus to detect changes made without the consent of the author lies with the author, which should be detected at the galley proof stage.

Post publication error and negligence in science

Sometimes mistakes are noticeable after the publication of an article in a journal. Omissions, typos, ambiguous statements and flaws in statistical analyses are but few of the errors that may occur in publications. Such errors or mistakes may arise from human fallibility. When discovered, corrections and acknowledgements are effected in form of errata or addendum, preferably in another volume of the same journal in which the mistaken information was published. It is more honourable for a scientist to report such mistakes rather than pretend lack of their existence. Failure to effect the timely corrections and openly too may attract condemnation from scientific community when such errors are detected by readers. Some publishers unnecessarily delay the sending of reprints to authors even when the publication process has been completed.

Providing reverse criticism on a second review

Science is dynamic and therefore, ideas for improvement occur from time to time. It is therefore possible for a mind change to occur between one review of a manuscript and another based on newly available evidences. This does not however, invalidate the earlier publication. For example, the review of research protocols involving animals have changed over the years, and as such manuscripts involving the use of animals have also been reviewed based on animal welfare issues which were not considered in the past. Because of these changes, a protocol approved in 1990 may not be approved in 2007. For example, a research in surgery involving the use of unanaesthetized animals published in the 1960s by most journals will today be rejected based on its violation of animal welfare.

CONCLUSIONS

Research is an essential integral part of tertiary education and the society. The conduct of research contributes to the teaching-learning process, and without research, the process of advancement slows down or completely halts. In this write up, we x-rayed conduct and misconduct before research, during research, after research, during peer-review and after publication. In scientific research there are guiding principles that characterize formulations of hypothesis, design of experiment, identification of protocol, collection of data, statistical analysis, validation of results and discussion and listing of bibliography.

Establishment of truth is fundamental in the advancement of science, and the discovery of it should not be based on flimsy or encumbered by emotional or unscientific practices and therefore, the drawing up of a code of ethics for science is inevitable. Figure 2 is a suggested model depicting the relationships that exist among the researchers, colleagues, research material and the community.

Some of the misconducts that are apparent in science include; deliberate manipulation, forgery, fabrication, falsification, fiddling and plagiarism of data for self-aggrandizement. An unwholesome practice also exists whereby private sector participation in research, even though small, conflicts with researchers' interest. There should be appropriate sanctions for offenders who contravene these guidelines.

Proper acknowledgement of sources of information is paramount for a strategic harmony of research. Researchers who routinely fail to acknowledge the works of fellow scientists risk alienation. We propose that research committees be set up and given mandate to screen manuscripts leaving the faculty without prejudice. In view of the nature of rigours and risks involved in science research, we propose that adequate compensation and special packages are available to scientists and other workers involved in research and teaching. The issue of mentorship in academics is fast eroding, and this should be restored. In fairness, scientists that have attained heights of their professional callings at times make themselves unavailable and almost irrelevant in scientific discourse. Where then is the mentor to follow and academic heritage? The appointment of top scientists to positions not directly related to research creates a diversion from science. The huge resources committed to the process of attaining such positions thereby become misplaced.

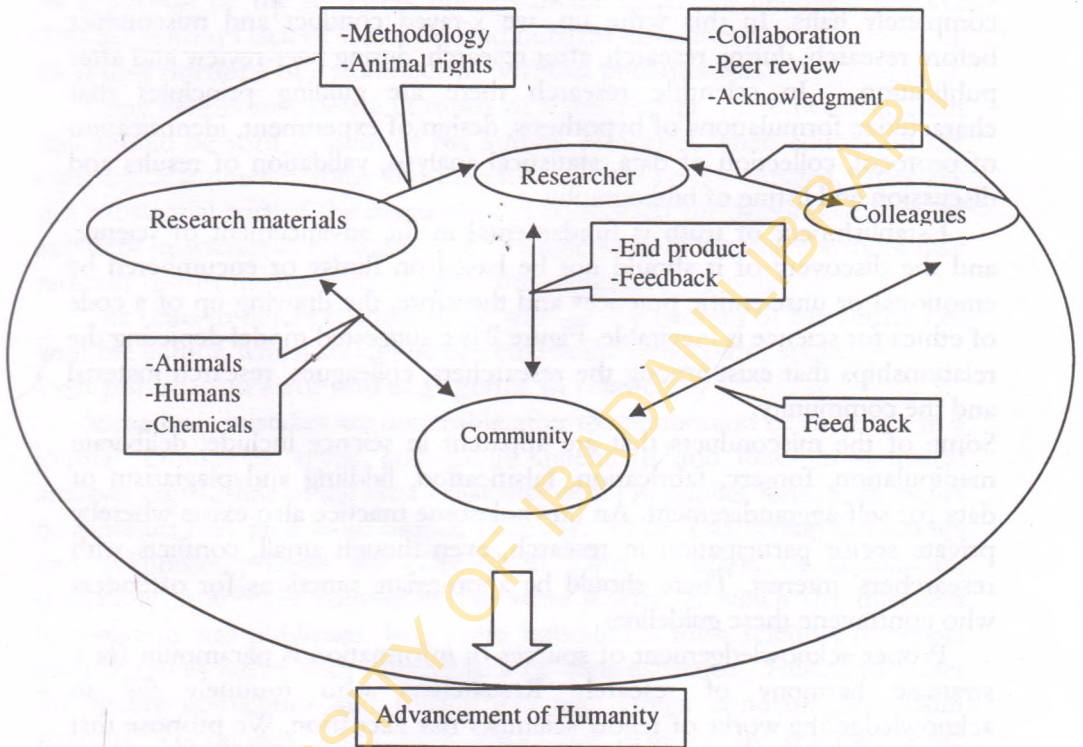


Figure 2. Suggested relationships existing among researchers, colleagues, research materials and the community

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