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## The workplace and evolving ethics for worthwhile productivity in the education sector

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### Abstract

This paper focused on the workplace and evolving ethics for worthwhile productivity with a focus on education. This becomes necessary because the education sector is bedevilled with several breaches ranging from insubordination, neglect of duty, physical confrontation, litigation, contempt of duty, examination fraud, misappropriation of funds, witch-hunting, the illegality of different magnitude and other forms of breaches. The paper explained basic concepts such as ethics, workplace ethics, leadership ethics, employees' ethics, and morality. The project is that ethics are universal and should be observed by all in the workplace, especially in the education sector as it is the muster point for all other institutions and organisations in society. The paper also emphasized that becoming ethically oriented at the workplace is sometimes challenging as people are usually faced with ethical dilemmas; a situation whereby one finds him/herself in a fixed between morality and universal ethics. To overcome such, the paper listed several steps that be followed. The paper concludes that the ethical codes of organisation listed could be written symbols, cultural norms, religious doctrines, or institutional codes of conduct; what counts is the reflection of those concerned on the specified ethical codes. Since man is so dynamic and different people come together to form organisations, the individuals concerned must go beyond the general organizational ethical behaviour to establish personal ethical behaviour that complements the general goals and objectives if the organizational goals and objectives must be achieved, and the values sustained.

### Keywords:

Workplace ethics, ethical code, leadership, and employee ethics.

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## **Introduction**

Naturally, all human beings have animalistic tendencies that could be violent in nature and counterproductive. But as a superior being endowed with dynamic taxonomy of reasoning and intrigue, which are the main distinguishing elements between human and other lower animals, man sought and still search for acceptable means for harmonious coexistence and productive lifestyle by defining what is right or wrong and what should be accepted as good or bad behaviour as individuals or in groups. This metamorphosed to what is called moral philosophy otherwise called axiology. Axiology is a branch of philosophy that deals with ethics and aesthetics. While ethics deals with the values that concern human conduct, aesthetics deals with the nature of beauty. However, our focus is on ethics – the value of upright human behaviour, especially in the workplace (education).

The concept of ethics comes from the Greek word “Ethos” which means both an individual’s character and a community’s culture. One needs to understand that, if man lives in isolation, his conduct/behaviour will be of no significance to anyone as it would have no impact on others as there would be no moral judge. But human behaviour becomes of utmost concern when living in groups, and one place group life is experienced is in the workplace. Among the workplaces, education stands tall because it remains the muster point for people from all walks of life; the good and the bad, the rich and the poor, the cultured and uncultured. This guides to the fact that there is personal behaviour and there is group behaviour (Dickerson, 2023). Since the workplace is a collection of individuals with distinct values and interests but interact and interplay to bring about the attainment of set goals and objectives, then knowledge of ethics/ethical codes becomes critical.

## **Concept of Ethics**

Ethics is the study of what is right or wrong in human conduct. This is a branch of Philosophy which studies moral principles. Hence, Ethics is also known as Moral Philosophy. Ethics is the study of values with specific reference to human conduct in relation to what is right or wrong to do (George, 2018). It is a concept that refers to the rightful direction of human conduct. It, therefore, implies that; there are things an individual might think of as good/right for him to do but could be wrong when placed in the perspective of a wider range of people. However, it is wise to state here that; if behaviour could be accepted as right or wrong, then there must be specifications and clear definitions of what should be accepted as right or wrong behaviour. It is necessary to state here that, while morality and ethics are interchangeably used in everyday life, they are not the same things (George, 2018). The differences can be presented thus;

<b>Ethics</b>	<b>Morals</b>
Reasoning is involved	Holds on to what is described
It goes beyond rules	It holds on to hard and fast rules
Universal in nature	It is relative to society/culture
It is for the survival of the Organisation/society	For the survival of the individual
Ethics is Reasoning +Morals.	Morals do not count on reasoning; “it must be”

Source; George (2018).

Thus, one can be very morally conscious but ethically incorrigible (irredeemable or poor)

From the table above it is clear that to be moral is all about adhering to what is described (by society, religion, or the education system). But to be ethical, one should figure out what is right – by applying some principles and considering all the complexities involved (Singh& Prasad, 2017). Clearly, the ethical life is the harder path. One can be very morally conscious but ethically incorrigible (irredeemable or poor). Thus, ethics is Reasoning +Morals. Ethics attempt to address such questions as

- How should people live?
- Shall people aim at happiness or at knowledge, virtue, or the creation of beautiful objects?
- If they choose happiness, will it be their own or the happiness of all?
- Is it right to be dishonest in a good cause?
- Is it right to breach the rule and save lives?

These questions suggest that there could be principles guiding ethics, hence ethical codes.

### **Ethical Codes and Workplace Ethics**

The workplace is a community of its own with expected behaviour patterns that are completely away from what is obtainable in the conventional community. The modus operandi of organisations varies according to the operational demands of the foundational goals and objectives. Nonetheless, ethics are universal in nature to some extent; that is why it is generalized as workplace ethics (Singer, 2023). People should be reminded that; ethics are principles and values an individual uses to govern his activities and decisions. In an organisation, a code of ethics can be explained as:

- A set of principles that guide the organisation in its programmes, policies, and decisions for the business.
- It can also be described as a set of values that guides the behaviour and decision-making process of an organisation and its people.
- It is a set of guiding principles for professionals and organisations to help them conduct business in a fair and honest manner.
- It is a set of guiding principles that helps members of the organisation to align their behaviour with socially acceptable norms and tells them how they are required to approach problems in their career or professional life.

The ethical philosophy an organisation uses to conduct business can affect the reputation, productivity, and bottom line of the business. Ethics in an organisation matter

because the productivity of the organization is stringently tied to the ethical code and practices guiding it. It is therefore indisputable that unethical behaviour can cost an organisation its reputation and affect its productivity and marketability. Generally, workplace ethics encompass the following elements of behavioural disposition; integrity, discipline, honesty, respect, and accountability; transparency, humility, humane, punctuality, due process, impersonality, personality, self-control, confidentiality, team spirit, tolerance, self-esteem, selflessness, and the like. When the workplace lacks these qualities, assuredly, it would be heading for destruction. Education is the transformational institution (organization) in society saddled with the responsibility of transmitting and upholding acceptable behaviours and standards for societal continuity. It is, therefore, expected that the sector should be reputable for maintaining workplace ethics to ensure productivity.

### **Importance of Workplace Ethics to Education**

Many organizations create specific ethical codes that guide their operations and how their processes impact stakeholders' overall interests and activities. These ethics may help organizations maintain specific standards of accountability, responsibility, and professionalism (Dickerson, 2023). Specifically, workplace ethics has the following importance: Accountability, Responsibility, Equality, Transparency, Trust, Fulfilling promises, Loyalty, Mutual Respect, Fairness, Cooperation, Dedication/Commitment, Discipline, Professionalism, Sustainability, and Legality.

No educational institution/organization can survive without these values. Perhaps, it is in the realization of this basic truth that the education system is guided by different rules and regulations that are bureaucratically designed to guide the conduct of members.

### **Basic work Ethics for Organisation (Education)**

Work ethics is a self-commitment/resolve to be responsible and honour the job, take pride in hard work, and deliver the best results possible — even when one does not feel like it. It is stakeholders' resolve to be proactive in the workplace, and take responsibility for their own actions, behaviours, and decisions for the good of the organisation. They put their values above their feelings and perform based on a set of moral principles, rather than what mood they may be in. Work ethic is much more than simply putting in some extra hours at the office or pushing too hard. It is all about being accountable, dependable, and self-driven thereby acting in advance of problems instead of just reacting to problems (Singh, & Prasad, 2017). Workplace ethics require a display of **compassion, fairness, firmness, honour, responsibility, and integrity**. Work ethic also involve staking the initiative at work, following through with projects, meeting deadlines, collaborating effectively with team members, staying enthusiastic and a lot more. The education system is tied to strict compliance to set instructions on time, job delivery, uprightness, collaboration with others, acceptance of roles, and obedience to instant rules, mutual respect, civility, accommodability, and so on. These would be meaningless without basic ethics (code of conduct). The reason is simple. Education is a place where leaders are nurtured and everyone in it is adjudged a

prospective leader. As such, the education sector will be counterproductive if leaders are not ethically guided.

## **Leadership Ethics**

The best way to understand leadership ethics is to first understand ethical leadership. By way of explanation, Ethical leadership is the art of influencing people (subordinates) and guiding them (by super ordinate) to make good decisions rooted in ethical values like fairness, morals, ethics, trust, honesty, accountability, equality, mutual respect, commitment to work and honesty (Zhang, Zhou & Mao, 2018). It is a way for leaders to teach people the difference between right and wrong. It provides value to organisation by motivating employees to be inspired and hold up their philosophies and uphold the ideals and values (Moore, 2022). Leadership that is at variance with the followership must be heading towards crisis. Moore systematically summarized the principles of ethical leadership with the acronyms F-A-T-H-E-R. The FATHER Framework implies six key values for leaders which are Fairness, Accountability, Trust, Honesty, Equality & Respect. A leader without these values is not an ethical leader.

In an organization, there are general ethics, leadership ethics and employees ethics. There is the need to know all these because the subordinate today will eventually become the super ordinate soon. The ethics that leaders in an organisation use to manage employees may influence the morale and loyalty of workers. The code of ethics leaders use determines discipline procedures and acceptable behaviour for all workers in an organisation. When leaders have high ethical standards, it encourages workers in the organisation to meet the same level. Ethical leadership also enhances the organisation's reputation in the labour market and community. A solid reputation for ethics and integrity in the community may improve the organisation's overall productivity. To achieve and sustain the desired goals of an organization, Bazerman (2020) listed the general ethical values leaders must exhibit:

## **General Leadership Ethics**

### **1. Vision**

In every organization, the leader requires, not just good but a clear vision. He/she must be able to see into the future and determine the next level, possible challenges, and solutions even when it could be aborted before manifestation. He/she should be able to rate the impact of his/her decisions and the team's performance on the organization in line with the expectations of the organization when it is yet to manifest.

### **2. Values**

In an organization, personal values must be subsumed or swallowed by common/collective values. However, the leadership of an organization must possess values that must reflect the collective values that must be of positive impact. In other words, leaders must define what they stand for and what they do not stand for. An ethical leader should take care that he/she is not compromising on anyone's morals and ethics and then lead the team by

establishing values that will motivate the whole team and help them get an identity for themselves.

### **3. Voice**

A leader without a voice is as good as a stooge. Hence, an ethical leader should have a clear vision set of the goal and the way to approach it. Also, it is essential to voice this vision. There should be transparency in the team, and everyone should know each other's thoughts, especially the leader should take the initiative for this.

### **4. Virtues**

Virtues are desirable qualities in a person's behaviour. Virtues are generally accepted behaviours, though not possessed by all, that do not cause harm to others. An ethical leader should be virtuous, thereby inspiring others to promote virtues and morals as well. The leader should be sure that his vision, voice, and values are in line with other people's positions. Specifically, leadership ethics for inclusive leadership roles must include the following: value sharing, quality orientation, openness, participation, succession planning, setting high ethical standards and meeting them, being fair in all personal decisions, keeping words made, treating everyone with respect, firmness, humorous, diplomatic, accommodating, empathic, kindness, sensitive, thorough, flexible, meticulous; and many others. Leaders without these ethical values cannot be productive in any way. However, leaders alone cannot make a difference in the workplace without the employees, hence ethics for employees.

### **Ethics for Employees**

The workplace is where the leadership and the employees meet to carry out their specified roles for the good of the organization. In the workplace, people are guided by ethics. The employees' ethics refer to how employees in an organization control themselves and their overall work attitude. It is the attitude of the employee that presents the image of the organization to the public (Roy, 2023). Ethical behaviour among workers in an organisation ensures that employees complete work with honesty and integrity. Employees who are guided by ethics adhere to employee policies and rules while striving to meet the goals of the organisation. Ethical employees also meet standards for the quality of their work, which can enhance the institution's reputation for quality products and service delivery (manpower development)(Roy, 2023). Basically, employees are expected to hold on to the following ethical values.

### **Punctuality**

Punctuality means keeping to time in all ramifications, being prompt, reliable and regular at work; reporting, timing and being available at all possible times. Finishing tasks on time, arriving on time, adhering to break-time procedures, and reporting to supervisors of issues in a timely way are all examples of actions that respect the importance of time in the workplace. It is a major requirement for employees if they must be on the job.

## **Accountability**

Accountability is indispensable in the workplace. Employees and employers alike should be held accountable for their work which means they should be held accountable for ongoing projects, daily running and activities at the workplace and take responsibility for errors when they occur. Through accountability, commendations and promotions are made; punishment and disciplinary measures are also meted out.

## **Professionalism**

Professionalism simply implies exhibiting behaviour in a position that shows one knows what s/he is doing, or s/he is well informed about the expectations of the organization. Employees that demonstrate professionalism (skills, competence, expertise, and technical know-how) show up and take their work seriously, while remaining respectful to others, (both super ordinate and subordinate). They must also dress well to reflect their role description.

## **Productivity**

The essence of employment is productivity. The ability of an employee to remain focused and avoid distractions, ignore external influences, and overcome hurdles that could prevent them from completing assignments determines the level of productivity. Productivity is determined by the level of attainment of objectives set. In other words, productivity would be a mere concept without a set goal to be achieved within a set timeframe. It is a measure of what has been achieved within a record time in line with the set target. So, one can be at work every day without being productive. In the same way, one cannot be absent from work regularly and still be productive, unless the objectives are skeletal stated.

## **Individual Ethical Behaviour and Productivity**

People differ in interests, values, opinions, understanding and application of knowledge in real-life situations. This accounts for individual ethical behaviours otherwise referred to as Character. Individual ethics is a category of belief or ideology that determines what a person believes about morality, right and wrong, good, and bad (Arciniega, Stanley & Puga-Méndez (2019). This is relatively different from the general workplace ethics even though it cannot be completely detached from it. Individual ethical behaviour is derived from an individual's conscience which evolves to become the Character of the individual. Personal ethics define who you are as a person (not as a group) and can have a serious influence on all aspects of one's life, including the workplace, family, finances, and relationships out there (Arciniega, Stanley & Puga-Méndez (2019). The way one talks, reacts to issues, responds to attention, relates with others and so on, differs from one person to another. This is obvious in the workplace as some people are looked upon as threats to relationships in the workplace, wild, indignant, self-centred and unreliable while others are described as humane, accommodating, inspiring, encouraging, motivating and receptive.

Passkeys Foundation (2022) identified ten universal moral values that bother individual ethical behaviour. These virtues include honesty, integrity, promise-keeping,

fidelity, fairness, caring for others, respect for others, responsible citizenship, pursuit of excellence, and accountability. Also, the Josephson Institute for Ethics (2023) promotes the Six Pillars of Character which are; trustworthiness, respect, responsibility, fairness, caring, and citizenship. An individual without any of these is as good as an animal and should not live among men. The six pillars of Character as identified by Josephson Institute for Ethics (2023) are;



### **Ethical Dilemma in the Workplace**

Often, at the workplace, leadership and followership come into a fix concerning decision taking. The situation can be so rough that sleepless nights could be experience. This situation is called the Ethical Dilemma. An ethical dilemma in the workplace is a situation where a person must choose between two courses of action, neither of which is morally acceptable. It is when a person is faced with two or more possible paths, all of which have ethical implications. It is a conflict between alternatives where, no matter what a person does, some ethical principle will be compromised (Hegde, 2021). Analyzing the options and their consequences provides the basic elements for decision-making.

An ethical dilemma is a situation in which a person must choose between two options, neither of which is clearly right nor wrong. Ethical dilemmas often involve difficult choices regarding personal relationships, professional responsibilities, and moral values.

The person is usually at a loss as to which path to take. Ethical dilemmas are exceptionally typical in the workplace, and they may arise from various sources of conflict or attitude. Ethical dilemmas include choosing between the lesser of two evils, making a difficult decision that could adversely affect others, and dealing with moral ambiguity.

Some examples of ethical dilemmas in the workplace are stealing company property, lying on your resume, fudging expense reports, taking credit for someone else's work, conducting personal business in the workplace, doing the bidding of your superior when it is in sharp contrast with due process, covering the mess of your subordinate to the detriment of the organization, because s/he is related to you, submitting sick leave request when one is not



sick; denying someone promotion because of personal gratification denied an individual (Hegde, 2021). Situations like this are deadly, especially in the Nigerian clime. To handle an ethical dilemma in schools or educational institutions, one can apply the value theory approach, brainstorm other solutions, or ask rather than accuse or assume.

### **How to handle Ethical dilemma**

An ethical dilemma is experienced in workplaces regularly; some of which have got people sacked or forced to resign. This is due to poor handling of the situation. Below are some tips on how to handle it should it happen as projected by Career Guide (2023);

#### **1. Analyse what is at Risk (The Risk Factor)**

Weigh the pros and cons of what is at risk in the scenario to help you determine what steps to take. Before bringing the matter to someone's attention, find clarity on the issue by assessing the risk. If you ultimately find the risk is high, consider taking appropriate action.

#### **2. Rely on Your Training**

Many companies provide ethical training for employees, especially for leaders. When in doubt about what to do in an ethical dilemma, consider reflecting on your training as guidance on what next steps to take. The training exists to both guide you in such situations and helps the organisation reduce its liability for such dilemmas. Make the training materials or experiences your reference point.

#### **3. Review Your Organisation Code of Conduct (Handbook)**

Many organizations have an employee handbook that outlines the professional conduct and behaviour expected. Such a book should be handy. Check for a chapter about ethics to see what information might influence your decisions. You might have an ethical expert or resource person you can reach out to; do not hesitate to call such a person confidentially or anonymously report the situation to him/her. Some people prefer this option rather than reporting directly to leadership to reduce any concerns about retaliation. But be careful who you contact.

#### **4. Refer to Industry Guidelines**

Some professions, like lawyers, accountants, and doctors, have industry guidelines or legal regulations that uphold ethical and moral behaviour. The education sector is not exempted from it. In most cases, ethical breaches can lead to disciplinary action which can result in loss of licensing, loss of job, promotion and in some cases demotion. Referring to codes of conduct and ethics can help determine what steps to take when solving challenging moral dilemmas bearing in mind that litigation can crop up. Taking counsel from a legal practitioner is not out of place when totally confused.

## **5. Trust Your Instincts**

People normally have a premonition of things to happen. There may be times when you sense something wrong surfacing at your workplace; do not ignore it, exploring it helps in some cases. This can help protect both the organisation and the individuals involved if there is unethical activity happening. Trusting one's instincts might also mean first confirming, or investigating the suspicions before taking other actions.

## **6. Have a Conversation**

Consider discussing the ethical dilemma with those involved directly to help manage the situation. You can gain perspective, ask clarifying questions, and attempt to influence those concerned to make a more ethical decision. If the issue remains unresolved after speaking with the person (s) directly, consider following due process.

## **7. Remove Self from the Situation**

If one finds self in ethical dilemmas consistently within a team or organization, consider leaving if no other attempts or actions resolve the situation. Finding other employment can help one ease stress and allow one to uphold his/her own personal standards and ethics. One might look to exhaust other options before committing to leaving.

## **Conclusion**

Man is civil in nature because he is rational, humane, reflective, critical in thinking and associable. This, perhaps, informs why man lives in groups in families, communities, organisations and the larger society. Associating in groups implies coming together of different people with different mindsets, ideas, ideals, interests, and expectations, irrespective of the level of homogeneity in culture, religion, belief system, educational background, and socialization process. This defines why there must be written or mutually accepted behavioural prescriptions called ethical codes. The ethical codes could be written symbols, cultural norms, religious doctrines, or organizational Codes of conduct (green book); what counts is the reflection of those concerned on the specified ethical codes. This is because man is the essence of any rule. Since man is so dynamic and different people come together to form organisations, the individuals concerned must go beyond the general organizational ethical behaviour to establish personal ethical behaviour, if the organizational goals and objectives must be achieved and the values sustained. The foundation for achieving personal ethical behaviour that will be universal is prescribed by Josephson Institute for Ethics (2023) thirteen "Be", which are:

- (i) Be a Star: - Settle for the best at the workplace. Do not be mediocre.
- (ii) Be Here: - Always strive to be present at work as an administrator or teacher. You cannot get right when you are not present.
- (iii) Be on Time: - Punctuality is a requisite condition for productivity. It is ethically required for maximum productivity.
- (iv) Be Responsible: - Irresponsibility is being insensitive to the set operational standards of the organization. It is counterproductive and should not be identified with any

- member of the education sector. Take the organization as personal, accept blames and success where such arise.
- (v) Be Prepared: - Preparation is a sure sign of responsibility. Be equipped with the requisite knowledge and skills for functional engagement.
  - (vi) Be a Tough Worker: There are bound to be challenges at the workplace. Only the tough can overcome.
  - (vii) Be a Good Listener: - A good listener takes the right decision and hardly falls into hasty mistakes that could question the ethical disposition of a leader or employee.
  - (viii) Be a Goal Setter: - One who does not set goals would have no goals to achieve. Set goals, work toward them and achieve them.
  - (ix) Be Confident: - Confidence gives the determination to get the best. Become determined to work ethically no matter what comes up.
  - (x) Be a Risk Taker: - Those who are afraid to take risks hardly achieve goals at the workplace. Take a risk provided it is within the ethical prescription of the organization.
  - (xi) Be Friendly: - Friendliness is a condition for harmonious relationships at the workplace. It is an instrument for productivity. Be friendly.
  - (xii) Be Honest: - Honesty is the heart of the ethical code at the workplace. Without honesty one remains a threat to the organization.
  - (xiii) Be Polite: - Politeness prevents violence, anger, and acrimony in the workplace. Trying to become polite to all at the workplace enhances productivity. These are universal virtues or ethical standards.

## **References**

- Arciniega, L.M., Stanley, L.J., Puga-Méndez, D. (2019). The relationship between individual work values and unethical decision-making and behavior at work. *Journal of Business Ethics* 158, 1133–1148 (2019). <https://doi.org/10.1007/s10551-017-3764-3>
- Bazerman, M.H. (2020), September-October). A new model for ethical leadership. Create more value for society. Retrieved from: <https://hbr.org/2020/09/a-new-model-for-ethical-leadership>
- Career Guide (2023). How to handle ethical dilemmas in the workplace (with tips). Retrieved from: <https://www.indeed.com/career-advice/career-development/how-to-handle-ethical-dilemma-in-the-workplace>
- Dickerson, K. (2023). What is work ethic? A simple definition (Plus 5 real-world examples). Retrieved from: <https://www.jobcase.com/articles/what-is-work-ethic-simple-definition-plus-examples>
- George, A.A. (2018). Ethics: Definition and concept made easy; with examples. Retrieved from: <https://www.clearias.com/ethics-definition/#:~:text=Ethics%20is%20the%20study%20of%20what%20is%20right,Hence%20Ethics%20is%20also%20known%20as%20Moral%20Philosophy.>

- Hegde, S.(2021, 23 December). What is an ethical dilemma? Retrieved from:<https://www.scienceabc.com/social-science/what-is-an-ethical-dilemma-definition-examples-real-life.html#:~:text=An%20ethical%20dilemma%20is%20a%20conflict%20between%20alternatives,their%20consequences%20provides%20the%20basic%20elements%20of%20decision-making>.
- Josephson Institute for Ethics (2023). Character counts: The six pillars of character. Retrieved from: <https://charactercounts.org/character-counts-overview/six-pillars/>
- Moore, B.D (2022, January 17). What is ethical leadership? Principles and practice. Retrieved from: <https://www.greatworklife.com/what-is-ethical-leadership-decision-framework/>
- Passkeys Foundation (2022). Individual ethics and personal moral development. Jefferson Center For Character Education. Retrieved from: <https://profitiv.com/individual-ethics-and-personal-moral-development/>
- Roy, B. D. (2023, April). 10 ways to develop strong work ethics among employees.<https://blog.vantagecircle.com/work-ethics/>
- Singer, P. (2023). Moral philosophy. Ethics Philosophy. Retrieved from: <https://www.britannica.com/topic/ethics-philosophy>
- Singh, C.& Prasad, M. (2017). Code of ethics in an organization. *Journal of Application or Innovation in Engineering & Management (IJAIEM)*; 6(5); 138-142
- Zhang, Y., Zhou, F. & Mao, J. (2018). Ethical leadership and follower moral actions: investigating an emotional linkage. Retrieved from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6180164/>