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# Artificial Intelligence Driven Composite Model for Strengthening Innovative and Sustainable Teaching and Learning Experience

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## ABSTRACT

The importance of effective classroom management cannot be overemphasized as problems associated with 21<sup>st</sup> century classrooms such as large class strength, sophisticated students, policy constraint, and cultural diversity among students militating against effective classroom management need urgent attention in order to create the needed shift. The study therefore presents a proactive approach to achieving positive Teaching and Learning environment with the aim of strengthening innovative and sustainable learning experience. To achieve this aim, elements of effective classroom management are identified, Applications of Artificial Intelligence technologies in a number of Microsoft productivity tools are reviewed, these tools are combined with the use of Microsoft OneNote to create an AI driven composite teaching and learning model capable of strengthening innovative and sustainable teaching and learning experience. Microsoft OneNote in this case, serves as a base productivity tool. The composite system with a specific cognitive content, showed that the proposed model has better potential to strengthen sustainable and innovative teaching and learning experience. It is therefore recommended that teachers and students should enhance their digital skills to enable them explore and employ hybrid of intelligent productivity tools optimally.

**Keywords:** Innovation, Artificial Intelligence, Sustainable, Intelligent, Teaching, Learning & Experience

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## 1. INTRODUCTION

The need to develop 21<sup>st</sup> Century skills in teachers and students in Nigerian Institutions of Learning for optimal performance in the classroom cannot be overemphasized. Problems associated with large class strength, sophisticated students, policy constraint, and cultural diversity among students militating against effective classroom management need urgent attention in order to create the needed shift. In this study, a proactive approach to achieving positive teaching and learning environment is presented. The aim of the study is to strengthen sustainable and innovative learning experience using a Hybrid of Intelligent

Productivity Tools. Specifically, the study is to identify factors responsible for the collapse of conventional (That is, non-ICT-based) classroom management systems critically analysis the conventional and ICT-Based classroom management systems for better insight. Also, to analyze a number of intelligent productivity tools and present a composite model for sustainable and innovative learning experience. Existing 21<sup>st</sup> century learning frameworks identified “Digital Skills” as one of the essential 21<sup>st</sup> century learning skills. Integrating digital technology into Information and Communication Technology (ICT) consist of computer-based programs and digital/telecommunication equipment and it is used to support human endeavors in an innovative manner. ICT integration into Explicit Curriculum [1] is described as “the means and materials with which students will interact for achieving identified educational outcomes”. The use of intelligent computer-based productivity tools is one of the reliable ways of achieving effective teaching and learning. Details of the intelligent features of some Microsoft’s computer-based productivity tools are explained in section 2.2.

Integrating digital tools (concepts and practices) into curriculum benefits both teachers and students as this endeavor helps them to understand how digital tools can be used to support effective learning, skilled communication, collaboration, evaluation, and analysis of information in a meaningful manner. It also keeps students engaged in the content in a stress free, flexible and fun filled manner allowing students to do more than just see and hear in the class. The Oxford Dictionary [2] defined class as “a course of instruction”. It is also used to describe “a group of students who are taught together”. A classroom is therefore defined as a room or any place where one learns and gain experience [2].

Classroom management is used to describe the task of planning, organizing, motivating, and controlling learning environments [3]. There is no hard-and-fast way to manage a classroom because there are different kinds of classrooms and each may differ in terms of class size; family and educational background; interest, cultural and capacity diversity of members of the class. Effective preparation, good teaching, fair and consistent discipline can help teachers manage any kind of classroom [4]. Classroom management is thus defined as “all of the things that a teacher does to organize students, space, time, and materials so that instruction in content and student learning can take place” [4]. No matter the format that is employed to manage a classroom, one thing is for sure and that is the “Aim” which is to create a positive learning environment.

## 2. MATERIALS AND METHODS

Effective Classroom management is a long-conceived idea which involves a host of procedures bordering on planning and decisions teachers must make to create a positive learning environment [5]. Providing understanding of the essential features of classroom management to teachers helps them to establish effective classroom management system. [4] identified the following six factors as concerns of a typical classroom management system:

- i. Physical space management.
- ii. Rules setting
- iii. Lesson planning
- iv. Content delivery planning
- v. Maintenance of appropriate behavior and
- vi. Promotion of good communication skills

**Physical space management:** This covers a design plan on seating arrangement for the class and different kinds of class activities [6]. It also covers the way students are distributed in the class that affects significantly the students' learning [6].

**Rules setting:** This has to do with establishing classroom “DOs” and DON'Ts students have to follow in order to maintain peace and control in the classroom.

**Lesson planning:** This deals with organization of proposed lesson.

**Content delivery planning:** This has to do with plans on how instruction is conducted.

**Maintenance of appropriate behavior:** This has to do with identification and implementation of ways of ensuring positive behaviors in students.

**Promotion of good communication skills:** This has to do with the encouragement of the use of effective means of communication to support learning and learning activities.

Pena and Amrein [7] noted that “Effective classroom management is essential for minimizing disruption and maximizing student task involvement”. Also, established guidelines which incorporate the essential features of classroom organization, control, and discipline, provide information to help teachers establish effective classroom management systems [5]. However, managing these concerns effectively using conventional means can be very challenging compared to when you incorporate Digital Technology.

There are different kinds of digital resources powered by different Computer technology vendors. The ICT-Based Classroom Management System presented in this work, employs digital resources powered by Microsoft Cooperation.

### **2.1. Innovative Teaching and Learning**

The use of ICT to support education management, teaching practices and learning is a welcome development as it stimulates innovation in the educational system. This fast-growing technology provides more flexible and effective ways for professional development for teachers [8]. It can also improve pre- and in-service teacher training, and connect teachers to the global teacher community [8]. While still upholding the conventional educational practices which include, the use printed textbook and centralized teaching strategy, classroom technology integration should be used to complement viable conventional education practices. This does not only give learners a broader understanding of contents but also encourage 21<sup>st</sup> century learning approach where learners are active in class rather than passive containers students. Despite the challenges that come with modern technology, the flexibility it provides to learning and teaching processes is a remarkable advantage to hold on to.

### **2.2 Examining Innovations of 21<sup>st</sup> Century Computer-Based Productivity Tools**

To effectively manage today's classrooms, teachers need to employ 21<sup>st</sup> (also described as 3<sup>rd</sup> Millennium) Century Skills with the aim of developing Core Skills (Oral communication, written communication, digital literacy, numeracy, collaboration, problem solving, critical thinking, creativity, imagination, student leadership and citizenship) in students following the fact that core skills are essentials every student needs to be able to compete favorably both in the classroom and in the global society. In this section, some 21<sup>st</sup> century computer-based productivity tools are examined from two perspectives.

The perspectives are:

- i. Intelligence and
- ii. Impact on users

There are quite a number of computer-based productivity tools. However, we are going to concern our study with Microsoft (MS) Productivity Tools since they are the most popular productivity tools of use in institutions of learning in Nigeria. Microsoft productivity tools such as MS Word, MS Excel, MS PowerPoint, and MS OneNote are constituents of Microsoft's Office Suit. The innovativeness of these tools is enabled by embedded intelligent features and the collaborative feature in them.

#### **Analysis of intelligent features in MS Word**

MS Word is a very common productivity tool that supports users from all fields of endeavor. Teachers use it to prepare documents such as lesson plan, attendance register, memos and other official documents. Students mostly use it to prepare their assignments and make notes. The MS Word "Editor" powered by machine-learning [9], helps users to construct documents with appropriate terminologies. The autocorrect feature helps users to construct well presentable documents [9]. It handles complexities of removing obvious errors in writing by looking for context and phrasing. Modern MS Word strongly rely on Machine Learning Algorithms to achieve a great deal of well-articulated professional documents within a short period of time.

#### **Analysis of intelligent features in MS Excel**

Microsoft Excel is generally used for listing (Cell of data laid out in rows and columns), calculation, and data analysis. With the advent of Artificial Intelligence, Microsoft Excel has incorporated AI-Driven features into its functionality [10]. These AI driven features provide services such as:

- Helping users to identify trends, patterns, and outlines in a data set in seconds
- Turning a single piece of text into an interactive entity containing layers of rich information.
- Converting pictures of printed data table taken with a camera into an excel spreadsheet with a single click of the mouse. The Pattern Recognition powered image recognition functionality in Excel automatically converts the picture to a fully editable table in Excel, eliminating the need to engage in manual data entering [10].
- Making calculations a lot easier, faster, and error free. With AI-Driven "Dynamic Array" feature, you can write one simple formula and get an array of values returned in specific range of blank cells.

#### **Analysis of intelligent features in MS PowerPoint**

Microsoft PowerPoint productivity tool has AI-Driven feature that helps a user be a better presenter. Highlights of AI-Driven features in PowerPoint [11] are:

- PowerPoint Designer: This feature helps users to create slides that suit their company's brand, make theme recommendations that include desired photos, theme styles, and colors. and give clearer meaning to measurements on a presentation.
- Presenter Coach: This feature helps in building users' presentation skills. It has features that check presentation speed, guard against reading from the slide, and long break in speech.

These intriguing features are products of a blend of AI technologies such as Natural Language Processing (NLP), Machine Learning (ML) and Expert System (ES).

### **Analysis of Intelligent Features in MS OneNote**

MS OneNote is a productivity tool designed for free style note-taking. It provides a simple way to organize and share notes; bookmark and tag notes for easier searching; add pictures, drawings, and spreadsheets [12]). It also has a feature that can convert handwritten notes to text [13]; record audio and video notes; get notes from the Web or mobile devices. OneNote uses Machine-Learning technology to translate a “source” text from one language to a different “target” language. Furthermore, Deep Neural Network technology is used to achieve quality speech translation techniques Unlike the “statistical Machine Translation (SMT)”, Neural Machine Translator (NMT) translates large amount of text. Microsoft Translator supports more than 60 languages for text translation through its translator Application Interface (API) [14].

### **3. ARTIFICIAL INTELLIGENT DRIVEN COMPOSITE MODEL**

A smart way of achieving innovative and sustainable teaching and learning experience is the use of a hybrid of intelligent productivity tools in supporting teaching and learning endeavors. In this context, Innovative Teaching experience is described as one that:

- i. Promotes personalized and powerful learning for students through student-centered pedagogies
- ii. Builds students’ ability to extend learning beyond the classroom in ways most relevant to knowledge-building and problem-solving in today’s world.
- iii. Broadens and deepens learning opportunities by Integrating Information and Communication Technology into pedagogy.

Whereas Innovative Learning experience is described as one that unleashes learners’ ability to:

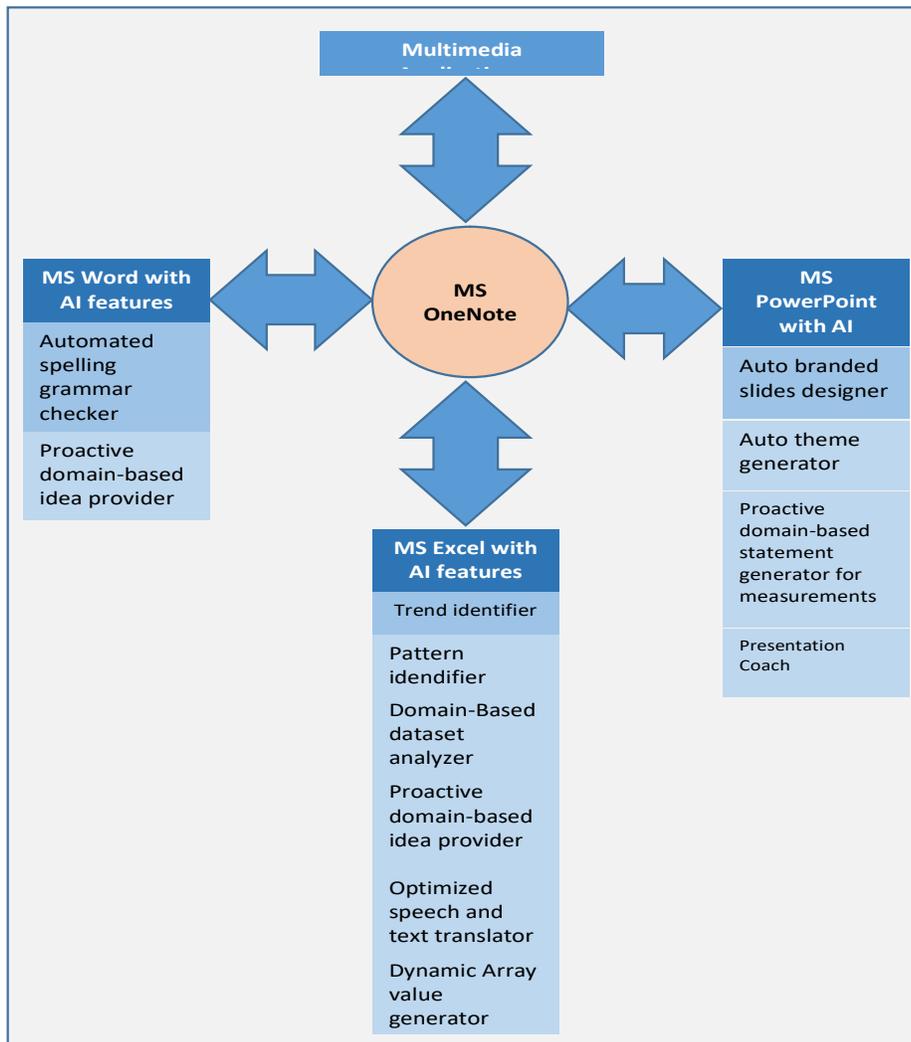
- i. Collaborate and negotiate with other people within and outside their main field of endeavor to make substantive decisions.
- ii. Go beyond reproducing what they have learned to construct knowledge through interpretation, analysis, synthesis, or evaluation.
- iii. Generate ideas and understanding that are new to them
- iv. Apply the knowledge constructed in a different context
- v. Connect information and ideas from two or more academic disciplines.
- vi. Show cutting edge use of technology for learning

The proposed model here presented is designed to achieve the above-mentioned innovative learning and teaching experiences. The use of a hybrid of intelligent Microsoft Productivity tools is to create flexibility and convenience. Figure 1 is a schematic of the proposed model. For effective deployment of the model, the following assumptions are made:

- i. Teachers have developed basic ICT skills
- ii. Students are conversant with computing devices (desktop or laptop or mobile phone)
- iii. Classrooms are provided with network infrastructure (wired or wireless or both).
- iv. Both students and teachers are conversant with Microsoft productivity tools.

The model is used to effectively implement the following features of a classroom management systems:

- i. Class Attendance
- ii. Content Delivery
- iii. Class participation
- iv. Continuous Assessment and
- v. Performance Evaluation



**Figure 1: A schematic of a hybrid of intelligent productivity tools**

#### 4. DISCUSSION

*Class Attendance:* The act of attending classes is an essential part of any learning system. Hence should be encouraged and monitored. Accurate data collection as it affects students' behavior towards class attendance is essential for maintaining the integrity of such a research [15]. Selection of appropriate method and the device used for data acquisition reduces chances of errors occurring [15]. In this study, the existing Conventional (physical notebook-based) Attendance Management System is replaced with Embedded Microsoft Excel-Based Attendance Management System. The reasons for replacing the conventional attendance system with Embedded ICT-based attendance system are to:

- i. Discourages false entry
- ii. Eliminates time consuming roll call procedure
- iii. Provide flexible way of handling errors without messing up the data acquisition means.
- iv. Provide an easier way to monitor, analyze, and report attendance records of individual student.

The uniqueness of ICT-based class attendance system is the capability to detect duplications [16]. Figure 2 shows a conventional Attendance Register. The register is designed with manually means. The partitioning of space into the required number of rows and column is done by the class representative (who may have poor drawing skill) using the traditional drawing tools (rule and pen). In some cases, the design comes out looking rough. Entries can be made in no particular order. Attendance confirmation can be done by student thereby creating loophole for mischief if not keenly monitored.

S/N	NAMES	MATRIC NO	11/1/2016	12/1/2016	13/1/2016	14/1/2016	15/1/2016	16/1/2016	17/1/2016	Signature
1	Imiete Sunday Eruni	UE/2014/B-ED4/8093	[Signature]	ABS	ABS	[Signature]	[Signature]	[Signature]	[Signature]	[Signature]
2	Ongyekulu Chizima Gift	UE/2014/B-ED4/8099	[Signature]	ABS	ABS	ABS	ABS	ABS	[Signature]	[Signature]
3	MICHAEL OKACE ADIHI	UE/2014/B-ED4/8106	[Signature]	ABS	[Signature]	[Signature]	[Signature]	[Signature]	[Signature]	[Signature]
4	ADUNDAI THINKEDEH BROWN	UE/2014/B-ED4/8091	[Signature]	ABS	[Signature]	[Signature]	[Signature]	[Signature]	[Signature]	[Signature]
5	GABRIEL EDITH ODUM	UE/2014/B-ED4/8127	[Signature]	ABS	[Signature]	[Signature]	[Signature]	[Signature]	[Signature]	[Signature]
6	ASEER UDUCHI	UE/2014/B-ED4/8129	[Signature]	ABS	ABS	ABS	[Signature]	[Signature]	[Signature]	[Signature]
7	NWAGIBARA VINCENT	UE/2014/B-ED4/8084	[Signature]							
8	STANLEY OMASIACHI	UE/2014/B-ED4/8150	[Signature]	ABS	ABS	[Signature]	[Signature]	[Signature]	[Signature]	[Signature]
9	NKORU AMARANI MARY	UE/2014/B-ED4/8116	[Signature]	ABS	ABS	[Signature]	[Signature]	[Signature]	[Signature]	[Signature]
10	UNOCH JOY DANIEL	UE/2014/B-ED4/8103	[Signature]	ABS	ABS	[Signature]	[Signature]	[Signature]	[Signature]	[Signature]
11	WOKOCHA DESIRE ISIDIA	UE/2014/B-ED4/8131	[Signature]	[Signature]	ABS	[Signature]	[Signature]	[Signature]	[Signature]	[Signature]
12	WOLEGAN BEATRICE A.	UE/2014/B-ED4/8143	[Signature]	[Signature]	ABS	[Signature]	[Signature]	[Signature]	[Signature]	[Signature]
13	DICKSON SWAIN OBIOME	UE/2014/B-ED4/8140	[Signature]	ABS	[Signature]	[Signature]	[Signature]	[Signature]	[Signature]	[Signature]
14	WITETE JACINTO BIODIB	UE/2014/B-ED4/8124	[Signature]							
15	AKANDISO C. DANIEL	UE/2014/B-ED4/8154	[Signature]	ABS	ABS	ABS	[Signature]	[Signature]	[Signature]	[Signature]
16	EMENIKE DESMOND C.	UE/2014/B-ED4/8148	[Signature]	ABS	ABS	ABS	[Signature]	[Signature]	[Signature]	[Signature]
17	KITEZ SAMUEL L. SAH	UE/2014/B-ED4/8158	[Signature]	ABS	ABS	ABS	[Signature]	[Signature]	[Signature]	[Signature]
18	AKUJOBI ERNEST	UE/2014/B-ED4/8110	[Signature]	ABS	[Signature]	[Signature]	[Signature]	[Signature]	[Signature]	[Signature]
19	WOLEGAN OYEMENACH C	UE/2014/B-ED4/8138	[Signature]	ABS	ABS	[Signature]	[Signature]	[Signature]	[Signature]	[Signature]
20	UMU SARAH OGBORFIO	UE/2014/B-ED4/8097	[Signature]							
21	SAMUEL PRECIOUS A.	Direct entry	[Signature]	ABS	ABS	[Signature]	[Signature]	[Signature]	[Signature]	[Signature]
22	TAMPERO GABRIEL JAMES	UE/2015/B-ED4/8101	[Signature]	ABS	ABS	[Signature]	[Signature]	[Signature]	[Signature]	[Signature]

**Figure 2. A sample of a manual class attendance register for Database Management Class of Computer Science department, IAUE, RS**

It is also shown that the manual attendance register show in fig. 2 has 6 small groups consisting of attendance profile of six students per group. The register adopted the conventional row-wise seating style where students sit one after the other facing the teacher. The serial number against each entry also serves as their seat number and height tag (The shortest student is given the smallest serial number whereas the tallest gets the highest serial number). In generating the manual attendance register, students enter their details (Name, Matric number, and signature) in the attendance register according to their first appearance in class. Subsequently they only need to sign against their names to show evidence of class attendance. For those who failed to attend subsequent classes, their signature spaces are filled with “ABS” meaning “ABSent”.

The meeting dates are indicated making it easier to identify the exact days students attended or did not attend classes. Each student's behaviour towards class attendance is derived from the Total Signature (indicated as TOT Sign) column in Fig. 1. The way students are distributed in the classroom is as important as the way seats are arranged in an active classroom. This idea aims to discourage any form of obstruction in the classroom and provide a clear view of presentations made in front of the class. ICT support for seating arrangement in the classroom is not covered in this article. However, the model described above is adopted in the proposed model.

*Content Delivery:* In a conventional classroom management system, it is observed that the teacher feeds students' heads with knowledge they may not have good understanding of and cannot transfer or apply in solving new problems. This teacher-centered method does not actively engage the students to unleash their potentials and also does not give them the opportunity to develop core skills. Even though technology-based learning comes with challenges, Education Technology has the flexibility to accommodate a variety of learning styles and abilities, in most cases through decentralized approaches. Supporting instruction delivery with ICT-based resources with intelligent features of ICT-based productivity tools such as Microsoft PowerPoint and OneNote do not only make the teaching and learning process fun but makes teaching easier and gives room for large group participation at the same time, while the lesson is in progress.

*Class participation:* in a conventional class management system, to get all students of a class to be involved in class activities is not time effective especially when they have to take turns in making their presentation. Some students might end up not contributing their ideas before the expiration of the allotted time for the class. This challenge is surmountable with the help of Information and Communication Technology. With the employment of Microsoft PowerPoint, students can facilitate a class discussion in a fashionable and précised manner. Presentation slides can be distributed to other students via email after the presentation thereby discouraging flying papers and cutting down the cost of producing hard copies of the material presented. Also, to effectively support leaning, animations, audio and video materials of real-life events can be inserted in the slides.

Questions can also be projected on slides for students to avoid misunderstanding. Student can respond to questions as individuals and as small groups from any location of the classroom using their own desktop or laptop or phone, they are interconnected (via a network infrastructure) and given opportunity to participate (via OneNote). OneNote automatically saves and retains its contents for as long as the author wants it. This feature of OneNote effectively supports effective learning. All participants' views, dates of participation, and participants' details are captured and saved for future use. This is very useful to the teacher as it provides the required information the teacher needs to evaluate students' performances in class participation. This analysis can be done at the end of every class or at the end of every topic or at the end of a semester.

*Continuous Assessment:* In a conventional classroom management system, the process of administering short quizzes and tests at the end of a class or in course of a class to large or small groups of students in order to confirm their understanding of the contents delivered is not time effective, it has a high risk of malpractice and does not always give room for immediate feedback and sharing of quality ideas. These issues can be taken care of with by the use of technology-based assessment method. Microsoft OneNote is identified as a viable ICT-based tool to use. It can be used to administer continuous assessment quizzes and tests. Responses from large or small groups are online. This means that, students' responses are displayed on the projected OneNote application as they make their responses via their desktops, laptops, and mobile phones. Figures 3 and 4 show the use of OneNote as a tool for managing key features of a classroom management systems.

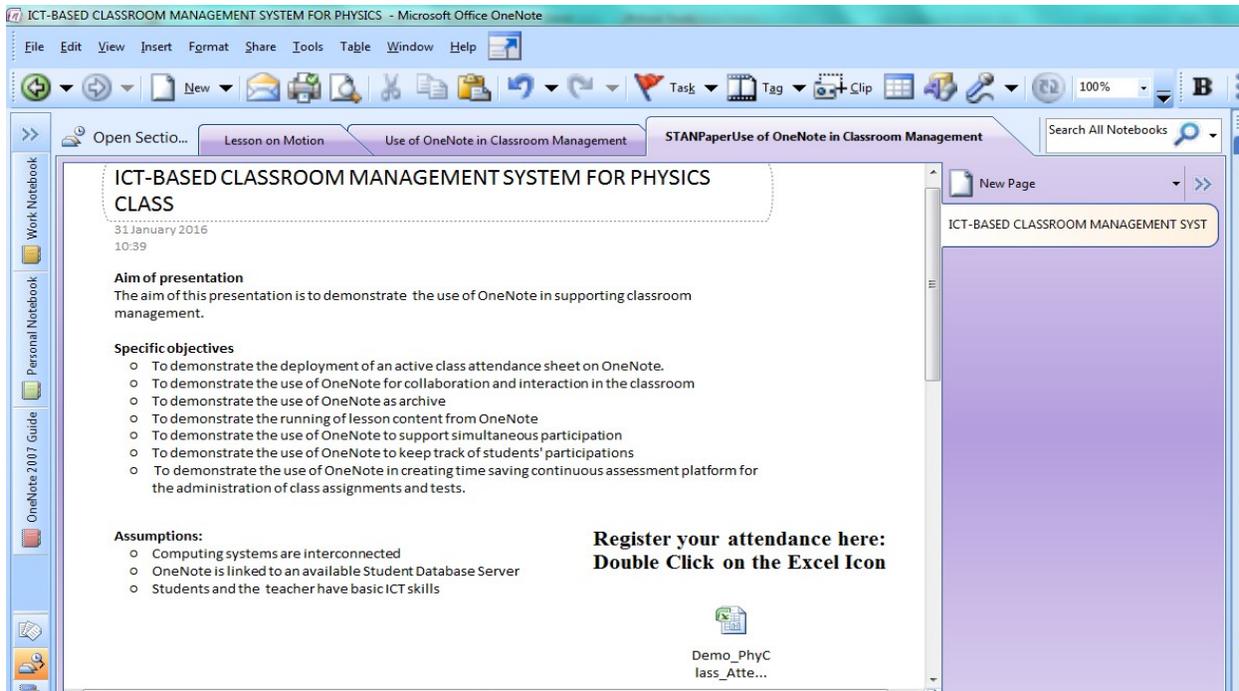


Figure 3. A cross section of proposed ICT-based Class management System showing the use of OneNote productivity tool to manage online class attendance and lesson plan

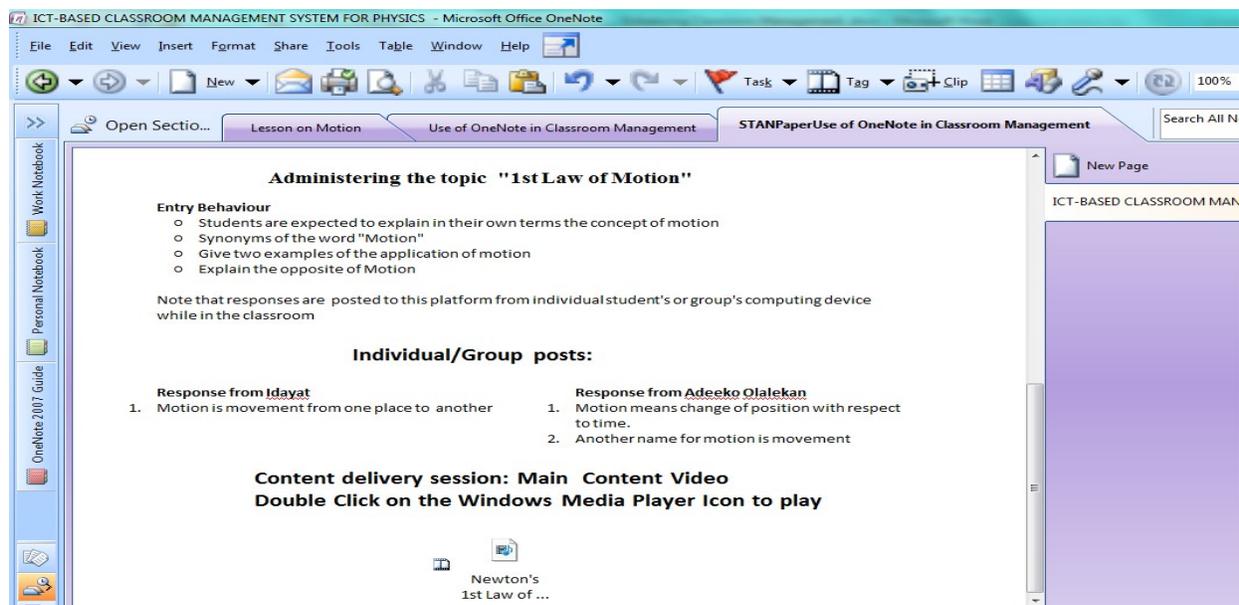


Figure 4. ICT-based Class management System showing the use of OneNote productivity tool to manage content delivery session and class activities (interaction, collaboration and feedbacks).

As show in fig. 3 and fig. 4, Microsoft OneNote is used to administer a physic lesson on “1<sup>st</sup> Law of Motion” while saving time and resources. Students whose computing systems are connected to the active OneNote platform have the liberty to post their opinions from their various computing systems in a peaceful manner. Class participation, collaborative learning, and effective time management are benefits that greatly influence academic excellence positively.

## 5. CONCLUSION

The need to develop 21<sup>st</sup> century teaching and learning skills for higher productivity in Nigerian Institutions of Learning is emphasized in the study as conventional teaching and learning approaches are observed to be undesirably silent on developing employable skills. The work which aimed to expose teachers to proactive ways of fostering positive learning environment and facilitating positive student achievement through Information and Communication Technology, specifically identified factors responsible for the collapse of conventional (That is, non-ICT-based) classroom management systems after a critical analysis of the conventional and ICT-Based classroom management systems. The design of a proactive model for innovative learning experience is then presented.

The significance of the study cannot be undermined as the exposure of teachers and learners to innovative way of combining intelligent ICT productivity tools for better performance in the classroom has the potential to positively influence students’ attitudes to learning. This potential stimulates high class participation. It also enhances students’ collaboration, communication, critical thinking and presentation skills. The ability of the model to manage students' performances, class attendance and continuous assessment instruments in a timely and convenient manner is also a significant achievement that cannot be undermined. It is therefore recommended that teachers and students take deliberate steps to enhance their digital skills to enable them explore and employ hybrid of intelligent productivity tools optimally.

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