ABSTRACT
Effective teachers of Soil Science must therefore be familiar with the unique qualities of soil as well as the practice of Soil Science through personal experience. Furthermore, they must be able to relate these unique qualities and experience to other disciplines and in other contexts. It could be argued that a unique set of teaching principles and strategies applies to Soil Science that is to say it is not different from those of other disciplines. This paper tries to identify some approach and strategies to employ for effective teaching and learning of soil science in schools. However, result of students rating of methods used were, field work 43%, laboratories 36%, Tutorials/group Discussions 11%, Lectures 8% Presentations 7% and Writing reports 5%. Therefore soil science teachers need to employ more strategies and techniques for effective teaching and learning to take place.

Key words: strategies, teaching, learning, soil and science

INTRODUCTION
Agriculture is the cultivation of land to produce plants and animals of direct value to man. Akinmade (2002). Also, Awuku et al, (1991), referred to agriculture as the cultivation of the soil, the production of crops and the raising of livestock, poultry and fish useful to humans. It includes the relevant aspects of production, processing, marketing and other aspects of the modern business of agriculture. Thus, Agricultural soil science is a branch of soil science that deals with the study of edaphic conditions as they relate to the production of food and fiber. Therefore, soil science deals with the systematic study of soils as a natural resource on the surface of the earth including soil formation, classification and mapping, physical, chemical, biological and fertility properties of soils as well as the properties in relation to their management for crop production. Effective teachers of Soil Science must therefore be familiar with the unique qualities of soil as well as the practice of Soil Science through personal experience. Furthermore, they must be able to relate these unique qualities and experience to other disciplines and in other contexts. It could be argued that a unique set of teaching principles applies to Soil Science (distinct from those of other disciplines), but even though Soil Science is taught worldwide, specific teaching principles have not yet been articulated and published, (Damien, et, al, 2011).

This paper is aimed at identifying and discussing the strategies and principles for the effective teaching and learning of soil science in schools for sustainable development and to emphasize on using simple methods and or techniques for teaching soil science in schools for quick apprehension and understanding by the learner. Improvisation of non available instructional materials is here by recommended.

APPROACHES TO THE TEACHING AND LEARNING OF SOIL SCIENCE IN SCHOOL
Study of the soil science is generally divided into two parts: (Agbede, 2009).
1. Field study
2. Laboratory study.
1. Field Study
A description (quantitative and qualitative) of the soil is best done in the field in its natural environment. Laboratory analysis entails much disturbance of soil properties. Some of the properties are actually lost in the process of transferring soils from the field to the laboratory. For instance, the moisture content and colour distribution where mottling exists. One unique feature with soil study in the field is that soil is studied as a component of the land. In essence, apart from describing the soil itself, the immediate
environment may be fully described. This is to say that at any point of soil description, the characteristics of the site must be fully described. Such characteristics include:

a. The climate of the locality
b. The nature of the parent materials
c. The mass and character of the vegetation
d. The relief of the locality
e. The age of the landscape.

The site of study must be precisely recorded so that future references and relationship with the environment can be correctly made.

**The Laboratory Study**

The laboratory study of the soil is chemical and mineralogical. In such studies considerable damage is done to the soil in as much as field characteristics are badly disturbed. Morphological studies however strive to present the soil as it is; sometime, trying to study the finer aspects or characteristics of the soil. In soil survey and land evaluation studies, much attention is paid to the field studies.

**STRATEGIES FOR EFFECTIVE TEACHING OF SOIL SCIENCE IN SCHOOL**

1. **Uniqueness**

   Soil Science is a scientific discipline that should be taught by people experienced in Soil Science who appreciate the uniqueness and functions of horizons (which define profiles), aggregates and colloids and are able to make connections within the discipline and with other disciplines. (Churchman (2010) for unique aspects of Soil Science.).

2. **Fieldwork**

   To demonstrate relevance and real-world connections and engage hands-on learners, use field and practical learning activities wherever possible and appropriate. Field activities are an important component of Soil Science as they help students to comprehend soil as part of the landscape and functioning ecosystem.

3. **Jargon**

   With students new to Soil Science, use every-day language, relate to familiar or current issues, and introduce Soil Science jargon gradually, such as, Pedon, PH, Metamorphic, Calcareous and so on.

4. **Active learning**

   Assist students to derive Soil Science theory by using current real problems, scenarios and case studies.

5. **Connections**

   To encourage the creation of connections, synthesis and integration, allow students to revisit concepts in different situations.

6. **Systems**

   To assist students develop systems thinking and transfer knowledge laterally and vertically and to appreciate that soil is part of larger systems, emphasise the nature and role of soil in various natural, managed, social and economic systems at local, regional, national and global scales.

7. **Communication**

   Allow students to interpret and present information and ideas in a variety of formats that resemble real-life scenarios where possible.

8. **Authentic problems**

   Allow students to solve contemporary, authentic, challenging problems in groups to enable them to apply their abilities and experience.

9. **Feedback**

   Provide students with timely, constructive and plentiful feedback to aid their learning.

10. **Assessment**

    The assessment regimes are aligned with the desired learning outcomes and group assessments are fair to all group members.

11. **Outcomes**
The outcomes resulting from the application of these principles are that graduates are proficient in 5 areas:
1. Identification, understanding and application of the unique features of Soil Science
2. The role, context and relationships of Soil Science to other disciplines and society as part of Interrelated systems
3. Identifying problems and designing relevant contextual solutions
4. The ability to coordinate and function within and between relevant groups and effectively communicate results
5. Manage self for personal development and lifelong learning

INSTRUCTIONAL MATERIALS FOR EFFECTIVE TEACHING OF SOIL SCIENCE IN SCHOOL
A standard soil science laboratory should contain the following instructional materials.
1. Stones (different types)
2. Soil samples (different types)
3. Wet and dry soil samples
4. Re-agents
5. Survey equipments
6. Soil map
7. Water
8. Shovel and spade
9. School farm (demonstration farm)
10. Manure
11. Fertilizer (different types)
12. Green house
13. A chart showing different types of erosion. E.t.c

Students Rating of Strategies Used for Teaching of Soil Science in School

<table>
<thead>
<tr>
<th>Activity</th>
<th>Responses (%)</th>
<th>Reasons given</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field work</td>
<td>43</td>
<td>Relating learning to real-life problems; learning by doing is more memorable; “non-stop learning”</td>
</tr>
<tr>
<td>Laboratories</td>
<td>36</td>
<td>Complement lecture material / relate to theory</td>
</tr>
<tr>
<td>Tutorials/ group</td>
<td>11</td>
<td>first-hand experience; group discussions</td>
</tr>
<tr>
<td>Discussions</td>
<td>8</td>
<td>“Being passive and just listening to lectures is boring. If you discuss and interact with the</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Teachers, your mind becomes more receptive and learning this way has a long-term impact.”</td>
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<tr>
<td></td>
<td></td>
<td>Time to process new material; promote deep thinking</td>
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<tr>
<td></td>
<td></td>
<td>“Well-structured and flowing, topics were relevant and discussed as individual blocks rather</td>
</tr>
<tr>
<td></td>
<td></td>
<td>than rushed through”; Class-involvement in lectures</td>
</tr>
<tr>
<td>Lectures</td>
<td>7</td>
<td>Putting ideas into own words enhances understanding; gives students the opportunity to study</td>
</tr>
<tr>
<td></td>
<td></td>
<td>the literature; drawing conclusions from data requires students to understand the theory</td>
</tr>
<tr>
<td>Presentations</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

Authors Field Survey, 2013
CONCLUSION
It was recognized that Soil Science is a unique discipline, the teaching of which requires a unique approach. Therefore, Soil Science cannot be taught effectively simply by following generic teaching principles because the unique nature of soil requires special approaches and ways of thinking. Teachers of Soil Science thus need to be experienced with Soil Science practices and must appreciate the complexities and relationships inherent within the discipline. Application of the Soil Science teaching principles will enable students to acquire knowledge, develop skills and become socialized into the discipline. Moreover, the desired outcomes of a graduate who has specialized in Soil Science will include the appreciation of soil as part of complex systems at a range of scales, the ability to communicate contextual solutions to relevant stakeholders, and to engage in continuous learning.

REFERENCES