Cogent Education

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/oaed20

Competence-based education: reflections on the context of teaching agriculture in Ghana's pre-tertiary schools

Seth Dankyi Boateng, Daniel Adu Ankrah & Seth Awuku Manteaw

To cite this article: Seth Dankyi Boateng, Daniel Adu Ankrah & Seth Awuku Manteaw (2023) Competence-based education: reflections on the context of teaching agriculture in Ghana's pre-tertiary schools, Cogent Education, 10:1, 2207793, DOI: 10.1080/2331186X.2023.2207793

To link to this article: https://doi.org/10.1080/2331186X.2023.2207793

Published online: 01 May 2023.

Boateng et al., *Cogent Education* (2023), 10: 2207793
https://doi.org/10.1080/2331186X.2023.2207793

cogent education

CURRICULUM & TEACHING STUDIES | RESEARCH ARTICLE

Competence-based education: reflections on the context of teaching agriculture in Ghana's pre-tertiary schools

Seth Dankyi Boateng[1], Daniel Adu Ankrah[1]* and Seth Awuku Manteaw[2]

Received: 06 April 2022
Accepted: 24 April 2023

*Corresponding author: Daniel Adu Ankrah, Department of Agricultural Extension, School of Agriculture, College of Basic and Applied Sciences (CBAS), University of Ghana, P.O.Box LG 68, Legon-Accra, Ghana
E-mail: dankrah@ug.edu.gh

Reviewing editor:
Dorothy Chen, National Chi Nan University, Taiwan

Additional information is available at the end of the article

Abstract: The ideal context for competence-based education (CBE) in the global south appears elusive with negative ramifications on both the teacher and the student. Using Ghana as a case study, this article shines light on the research question: What are the contexts and the implications of the contexts in which agriculture is taught on competence-based education? Drawing on a mixed methods approach involving cross-sectional data on 112 students, 238 teachers, and qualitative enquiries involving key informant interviews, and on-site observations. The findings showed inadequate facilities and low enrolment in agriculture. Specifically, 34% of pre-tertiary schools had less than 5% of the total student population offering agriculture. Theory-based pedagogies still dominate contrary to the core principles of competence-based education, culminating in students limited hands-on exposure that demotivates teachers and learners. We recommend the Ministry of Education focuses on competence-based education by increasing funding allocation to address the inadequate facilities, classrooms, and equipment needed for the effective teaching, learning, and the practice of agriculture. This article argues for sustained investment and conscious efforts directed at addressing challenges constraining CBE to allay the myths, drudgery, and low potentials ascribed to agriculture, with an ultimate aim to motivate the youth to pursue agriculture as a career and game-changer in providing self-employment and resolving the high unemployment phenomenon in the sub-region.

ABOUT THE AUTHORS

Seth Dankyi Boateng is a Senior Lecturer with the Department of Agricultural Extension, University of Ghana. He earned his PhD from the University of Reading, United Kingdom (UK). Seth has over 25 years' work experience teaching and researching in education and curriculum development, micro-finance and enterprise development, climate change, agricultural extension and rural advisory services.
Daniel Adu Ankrah is a Senior Lecturer with the Department of Agricultural Extension, University of Ghana. He earned his PhD from the University of Reading, United Kingdom (UK). Daniel has developed versatile skills in sustainable development, agricultural innovation systems, climate change, gender, food security, rural advisory services, agricultural value-chain development, agricultural policy and agricultural extension through experience in research, academia and development.
Seth Awuku Manteaw is a Senior Research Scientist and Director for the Council for Scientific and Industrial Research (CSIR) – Institute for Scientific and Technological Information (INSTI). He holds a PhD in Agricultural Extension from the University of Ghana. His research interests cut across development communication, agricultural extension and advisory services, gender, Information and Communication Technologies (ICTs), climate variability and change.

Subjects: Classroom Practice; Curriculum Studies; Middle School Education; Secondary Education

Keywords: Teaching facilities; agriculture; senior high schools; education; pedagogy

1. Introduction

This article interrogates the context within which Competence-Based Education (CBE) is delivered in the global south, the potential ramifications for outcomes of CBE, and the teaching pedagogies. CBE is expected to provide learners the practical skill, positive attitude, critical thinking and self-reliance that help learners identify their abilities and minimize school dropouts, thus encouraging the pathway of technical and vocational education (Mulder et al., 2017; Mulder, 2012; Wijnia et al., 2016). Given the merits of CBE, the global north inclusive of countries, such as Germany, United States of America, Finland, Netherlands, United Kingdom, Luxembourg have embraced it through capacity building of teachers and the provision of excellent facilities that encourage teaching and learning (Karani et al., 2021; Khanna & Mehrotra, 2019). In the global south, countries, such as Rwanda, South Africa, Nigeria, Tanzania, Zambia, and Ghana have equally embraced CBE and continue to make strides amidst challenges.

The methods employed by teachers in teaching different courses influence the professional competencies of the learners (Sanchez-Gracia & Hernaidez, 2021). Theory-based teaching methods promote the acquisition of more facts and less practical skills, while competence-based teaching methods emphasize the acquisition practical skills (Mulder et al., 2017; Boahin & Hofman, 2012; Yu & Chen, 2012). Competence-based teaching methods complement theory to improve the application of all learning experiences both facts and practical skills. The development of useful skills is generally reinforced by the selection and use of appropriate teaching methods (Bizimana et al., 2022). The literature (Karani et al., 2021; Wongnaa & Boachie, 2018) establishes that competence-based education equips students with industrial skills that are required by most job markets especially industries, thus has the potential of preparing students adequately for ready jobs after school.

In Ghana, the West African Senior Secondary Certificate Examination (WASSCE) was first introduced and administered in December 1993. The WASSCE examination is coordinated by the West African Examinations Council (WAEC). And since its inception, the council administers theory-based examinations and competence-based examination. Thus, Ghana uses CBE and knowledge or theory-based curriculum. Competence based training (CBT)[1]was initiated in Ghana in 2000 and formally introduced in 2004 through the Technical and Vocational Education and Training (TVET) (UNESCO, 2020). Ghana's Act 718 established the Council for Technical and Vocational Education and Training (COTVET) in 2006 to coordinate TVET across pre-tertiary and tertiary educational institutions. In 2012, Ghana's Ministry of Education developed curricula for the CBT and harmonized the qualification/certification framework (UNESCO, 2020). The council's main aim is to address unemployment among the youth through entrepreneurial and employable skills (Walenkamp, 2011; Gyadu-Asiedu et al., 2017).

Unfortunately, most learning situations in the global southin particular, Ghana, do not provide adequate opportunities for teachers to apply practical or hands-on teaching methods to complement the theory taught in schools (Wongnaa & Boachie, 2018; Adu-Yebaoh & Kwaah, 2018; Boahin & Hofman, 2012; Ondieki et al., 2018, GEA, 2006). This is borne not out of space but predicated by the nature of the assessment procedures used by WAEC that does not promote the use of practical learning skills (Acquah et al., 2017; Gyadu-Asiedu et al., 2017; Odukoya et al., 2014). Consequently, teachers are not motivated to use such practical experiences to impart knowledge. In the same manner, students are equally not motivated to demand the use of hands-on skills from teachers because they may consider such methods irrelevant in the determination of the nature and scope of their final WAEC assessment (Acquah et al., 2017; Gyadu-Asiedu et al., 2017; Waymark, 1997).

The assessment process nonetheless has a great impact on the CBE quality, it provides the ultimate goal to which all learning activities are aimed; it may help develop the perceptions of teachers and students about the learning assessment and the intended purpose of the teaching and learning. Teachers choose their teaching methods appropriate to meet the goal of the assessment, while students use the assessment method as a basis to select their learning experiences and define the goal of the learning experience (Karani et al., 2021; Khanna & Mehrotra, 2019).

Given the nature of assessment of competence-based courses by WAEC, students are obliged generally to learn to pass examinations, consequently, they focus on means that enable them to acquire the highest grades for academic progression. Students end up completing competence-based programmes such as agriculture with very good grades, defective of the acquisition of the required technical skills (Acquah et al., 2017; Gyadu-Asiedu et al., 2017; Ukonze, 2020). Rightly so, teachers may resort to the use of theory-based learning approaches to teach competence-based courses in contexts typified by lack of the requisite facilities, equipment, and resources (Gyadu-Asiedu et al., 2017; Acquah et al., 2017; Boahin & Hofman, 2012). This concern was echoed in Ghana's Ministry of Education (MoE) national pre-tertiary education curricula framework:

> *"A significant number of graduates from the basic and senior high schools are functionally illiterate, and ill-prepared for further education, training and job placement" Ministry of Education*, national pre-tertiary education curricula framework, *2018, P16. Ministry of Education, 2018*

Research has shown that teachers' competencies, experience, availability of equipment, resources, and class size significantly influence the application of appropriate teaching methods (Hastie & Saunders, 2014, Ondieki et al., 2018). The institution a teacher attended also has a significant influence on the approaches the teacher adopts, teachers who were taught with adequate practical equipment and resources are more prone to use such materials if they find them available for teaching (Nsengimana et al., 2020). On the other hand, teachers who lacked or had limited equipment while at school may not be motivated to use such equipment even if they are available. Against, this backdrop, this article seeks to address knowledge gaps, by addressing the research questions: What are the contexts in which agriculture is taught in Ghana's pre-tertiary schools? And what are the implications of the contexts in which agriculture is taught on vocational agriculture pedagogy?

It remains apparent that the context within which competence-based programmes are delivered has serious implications on teacher motivation and the quality of graduates. Generally, in the global south, limited accounts exist. For instance, Bizimana et al. (2022) assessed the performance of CBE in Rwanda, Kanyonga et al. (2019), examined CBE in technical colleges in Tanzania, Lawyer (2021) undertook a systematic review of the context of competence-based education and teacher effectiveness in Cameroon (Dambudzo, 2018), Zimbabwe (Kamgalawe, 2019), Tanzania (Njura, 2020), Kenya (Odewumi & Dekom, 2020) in Nigeria.

Nonetheless, the empirical literature dedicated to pre-tertiary CBE that focuses on Ghana appears anecdotal and scarce. For instance, Wongnaa and Boachie (2018) examined CBE in a tertiary institution in Ghana. Others (Acquah et al., 2017; Gyadu-Asiedu et al., 2017), examined CBE in Ghana's technical universities. Most studies in Ghana dwells heavily at the tertiary level and not the pre-tertiary. This article attempts to bridge the lacuna on CBE in Ghana and to stimulate further conversation in this regard. Explicitly, we do this in three ways: First, we articulate the context of teaching CBE in pre-tertiary institutions and its implication for teaching pedagogies and consequently the training of graduates with employable skills. Second, we highlight the usefulness of CBE in providing a panacea to the high unemployment situation in Ghana and by extension, countries south of the Saharan. Third, we bring into perspective the pertinent but silent concern about the apparent decline and lack of interest in pursuing agriculture as a programme of study or

a career in pre-tertiary institutions, which appears to be a potential "time-bomb". Most of the countries in the global south pride themselves in being predominantly agrarian based, yet, the space is dominated by smallholder farmers who are aged (Hlophe & Mpandeli, 2021). Ironically, the youth constitute the majority of the population; nevertheless, they do not have interest in pursuing career paths in agriculture (Geza et al., 2021). The agricultural sector holds great potential in absorbing the youth in different segments of the value chain (Aduroja, 2021; Tarekegn et al., 2020). What then becomes the future of agriculture in the global south if the youth remain excluded? This is a question for critical thinking and policy action.

The remainder of the article proceeds as follows: the next section presents the review of relevant literature pertinent to the study. Section 3 presents the methodology employed by the study, while the penultimate section (section 4) presents the results and discussion. The last section (section 5) concludes and provides relevant policy recommendations.

2. Literature review

2.1. Competence-based education/training

In this article, we use competence-based education and training interchangeably. As a starting point, we define "competence". Mulder et al. (2007) defined competence as the ability to perform tasks and roles to set of standardised expectation(s). We note that competence pre-dates the work of Plato. Kouwenhoven (2010) defined competence as the ability to satisfactorily accomplish expected professional tasks associated with a specific profession. Mosha (2012) defines it to mean the skillset, knowledge and set of behaviours that is required by an individual to successfully perform tasks at school and ultimately to field of work. Most of the definitions emphasize the ability to accomplish functional, practical and tasks associated with a particular vocation or training. Wongnaa and Boachie (2018) defined competence-based training as an education that provides students with the requisite knowledge and skills through dedicated series of assessment acquired through demonstrations and practice that targets practical hands-on skills and knowledge acquisition. Competence-Based Education (CBE) targets equipping students with the needed employable skills and competences through learner-centered pedagogies. This contrasts the conventional teaching which dwells heavily on the theory and a mastery of the concepts. It is important to distinguish between skills and competences as the two concepts, though they appear similar, differ in some respects. The general consensus in the literature and a useful way to conceive them is that while skills constitute a person's ability to perform an activity, competencies constitute the integration of knowledge, skills and attitudes required to perform specific tasks. The implication is that skills are the talents and abilities one needs to complete a specific task. In contrast, competencies are the skills, knowledge, and attitudes that make one successful on the job (Cate & Schumacher, 2022).

The application of hands-on experiences in the teaching of competence-based education may improve teacher and student motivation, may have the likelihood of triggering learners' responses during the learning situations, improves recall of previous experiences, provide systematic feedback, and facilitate appropriate practice. Teachers who use this instructional approach efficiently impart skills and knowledge to the learners and thus may trigger the desire for the application of practical skills in the entire working life of students. Gravina (2017) indicated that CBE enabled students to progress relative to their own pace. Haddouchane et al. (2017), argued that CBE teaching pedagogies had remained versatile and dwelt on series of activities that had replaced the traditional lecture-based approaches.

2.2. Context of Teaching Competence-Based Education (CBE)

The learner-centered pedagogy (LCP) strongly underpins CBE. This however remains elusive in most sub-Saharan countries. For instance, literature shows that CBE is delivered through a domination of memorisation of facts, traditional teaching pedagogies which emphasise theory (Ampadu, 2012; Ikeda & Matsubara, 2017; Ovute et al., 2015), contrary to the intended outcomes of CBE where

learners are anticipated to play an active role in the entire learning process. Mosha (2012) argued that CBE aims at developing the professional competencies needed for the corporate world of job.

The context that can facilitate effective delivery is, however, saddled by many difficulties. Rogan and Grayson (2003) indicated limited physical resources, and teacher, limited experience and teacher capacity (Schweisfurth, 2011), Ndihokubwayo (2017) indicated that the inadequacy of laboratory equipment affects CBE.

Kyule et al. (2018) argued that the acquisition of quality competence-based agricultural education could be attributed to the quality training received by the teacher. The aim of CBE is to shift the emphasis from a teacher-centered to a learner-centered teaching pedagogy that improve practical competencies. Rightly so, Mulder et al. (2017) summarises that CBE places the teacher as neither the source nor the conveyance of knowledge but only facilitates learning with a focus on practical teaching. Hence the teacher's quality of training received greatly impacts the competences that can be facilitated.

Infrastructural resources are also critical in the delivery of CBE. The teaching of Agriculture as a subject requires appropriate infrastructure and facilities in place given its practical nature. Diise et al. (2018) indicated that this training extends beyond classroom instruction. Rufai and Muhammad (2013) indicated that this includes the presence of laboratories, equipment, workshops, and teaching aid. Karani et al. (2021) further indicated that the teaching of agriculture required space outside the confines of the classroom to practice. This includes the school farm, with the provision of the appropriate personal protective equipment to practice the hands-on exercises and demonstration (Omae et al., 2017). Mokaya (2013), indicated that Kenyan schools well-resourced with infrastructural facilities performed better in the national examinations given the since the conducive context for learning. Chauke (2016) confirmed the finding in South Africa that proved that inadequate infrastructure affects the learner's competencies. Moore (2017), indicated carrying out practical activities at school farm helps in skills acquisition, retention and application, hence positive learning attitude. Rissanen et al. (2019), showed that regardless of the competencies and skills of a teacher, learners will fail to fully grasp and deploy skills without the practice. The extent to which the learner interacts within the environment or context needed for CBE remains essential. Bawakyillenuo et al. (2013), estimated that 80% of industry stakeholder pointed to skills gaps as a major problem the confronts the Ghanaian industry's labour market. Capacity building with requisite industry skills remains vital in promoting industrial growth and efficiency. Ironically, this challenge seems to persist as a structural problem in Ghana.

The literature (Ndihokubwayo, 2017; Mosha, 2012; Chauke, 2016; Moore, 2017; Omae et al., 2017; Kyule et al., 2018; Mulder et al., 2017; Diise et al., 2018; Wongnaa & Boachie, 2018; Rissanen et al., 2019; Karani et al., 2021) shows that Ghana's CBE is guided by about five (5) core principles:

(1) Availability of requisite facilities and training materials are core to the competencies to be achieved. The context and resources needed for the effective teaching of agriculture include the presence of adequate infrastructure, workshop(s) equipped with the appropriate tools and equipment, tractors, school, farm, and science laboratory.
(2) The theory is integrated with skill practice and knowledge acquisition in an environment supportive of the performance of skills.
(3) Methods of teaching and learning instruction involve mastery learning, i.e. students can master the required skill and knowledge.
(4) Flexible training approaches including small group, large group activities, and individual activities.
(5) The teacher is a facilitator of knowledge and skills, thus it is learner-centered and not teacher-centered.

We therefore embed our results and discussions on the five core principles.

3. Materials and methods

The study was part of a cross-country study conducted in Uganda[2] and Ghana, whose educational systems are undergoing reforms to improve access and relevance to the world of work. The two countries share a common educational heritage as they have modeled their education systems similar to Great Britain. The study focused on the formal teaching methods used in teaching agriculture at pre-tertiary schools (Senior High Schools). The necessary ethical clearance was obtained for the study to be conducted in Uganda and Ghana.

This study is deeply rooted in a qualitative approach involving key informant interviews, and on-site observations of the teaching-learning facilities and practices. Qualitative research approach permits an in-depth understanding into the "why", "by who", and "how", a phenomenon unfolds in its current state (Lewis, 2015). The study's research design employed a mixed-methods approach. Data obtained from the quantitative data collection instruments were further triangulated with data from the qualitative instruments through key informant interviews and on-site observations. The research design employed the cross-sectional survey and case study design. The unit of analysis was pre-tertiary institutions that offer systematic instruction in agriculture, inclusive of senior high schools, teacher training colleges and agricultural colleges. The target population of this study were students, teachers, and instructors of agriculture in pre-tertiary institutions. One hundred and twelve (112) schools were randomly selected from a list of senior high schools offering agriculture in four regions (Greater Accra, Central Region, Ashanti Region, and Northern Region). These regions were purposely selected as they constituted the regions with a greater concentration of second-cycle educational institutions. Two hundred and thirty-eight (238) teachers were randomly selected from the schools for the research.

For the qualitative enquiry, the researchers purposively selected the participants for key informant interviews. This process was guided by individuals who were identified based on their in-depth knowledge and experience teaching or providing leadership in agricultural education. The use of key informants has been given credence in the literature (Jennings, 2020; Yazdani et al., 2018). In each of the four regions, averagely 15 key informants were identified and interviewed. This was done in a participatory manner where teachers were asked of individuals knowledgeable in the issues under investigation. Individuals suggested were engaged in a preliminary assessment to gauge their understanding and depth of knowledge on the issues before being finally selected to be interviewed. The bases for placing a limit on the maximum number of key informants to interview per region was based on theme saturation. Theme saturation was achieved at a point where no new theme or idea emerged from an additional participant interviewed (see Ankrah et al., 2021; Ankrah, 2022). In ensuring the reliability and validity of the information gathered, in-class observations were conducted in all schools in the four (4) regions to validate responses collated during the key informant interviews. The in-class observations were conducted with teachers who were not part of the key informant interviews. This was to limit potential bias associated with key informants who had become familiar with the researchers.

The process of conducting the in-class observation was iterative and involved at least three (3) researchers having observations in the same school over the same issues under investigation. This made the results obtained robust and reliable. Additionally, information obtained from students were triangulated from teachers and vice versa. A semi-structured interview guide was developed to guide the process. The interview guide covered areas such as the background of teachers (qualifications and socio-demographic characteristics), years of experience teaching agriculture in SHS, means of teaching agriculture, nature of assessments/examining students, facilities available for teaching agriculture, class contact hours, number of students being taught, reasons for enrolment in specific SHS subjects, pedagogical teaching

approaches, opinions about nature of assessment by WAEC, teachers attitudes, and difficulties teaching agriculture

3.1. Data analysis

Data were analysed for both the qualitative and quantitative results. The quantitative data were analysed and presented through descriptive statistics, such as frequencies, means, and percentages using Stata 14.2. The qualitative data were analysed using the Nvivo. The analysis of the results dwelled on content analysis. Krippendorff (2018) defined content analysis as an analytical method that facilitates meaningful and replicable inferences deemed valid to be extrapolated based on text data. Various information covering key informant interviews conducted were recorded via recorders. The information was retrieved and transcribed. The researchers initially familiarized themselves with the themes emerging from the transcripts. This informed the basis for capturing the information in Nvivo. This stepwise process aided the categorization into major and sub-themes hinged on an inductive approach, based on a study by Kayapinar (2014). Any new theme was captured as a new node in Nvivo. This involved a first level of elemental coding techniques involving descriptive, and Nvivo coding (Saldaña & Omasta, 2016). This led to major themes, such as students' enrolment in agriculture, years of experience teaching agriculture in SHS, means of teaching agriculture, nature of assessments/examining students, facilities available for teaching agriculture, class contact hours, number of students being taught, reasons for enrolment in specific SHS subjects, pedagogical teaching approaches, opinions about nature of assessment by WAEC, teachers' attitudes and difficulties teaching agriculture. Statements illustrative of the major and sub-themes are used in the results and discussion. Data analysis was done within the framework of competence-based education.

4. Results and discussions

4.1. Student enrolment in SHS agriculture programme

Results from the analysis of the data on student enrolment (Table 1) revealed that 60% of the schools that offered agriculture had less than 120 students (made up of SHS 1, SHS 2 and SHS 3) offering agriculture in the entire school. Interestingly, we observed that 16% of all schools interviewed had less than 30 students offering agriculture in our sample. Low enrolment has implications for the allocation of teaching facilities dedicated solely for agriculture, especially the allocation of classrooms, laboratories, and assigning teachers purposively to teach agriculture. It was therefore not out of place that most schools offering agriculture lacked adequate classrooms,

Table 1. Students enrolment in agriculture

Students Enrolment in Agriculture	Frequency	Percent (%)
less than 30	18	16
Between 30 and 60	11	10
Between 60 and 90	14	13
Between 90 and 120	24	21
Above 120	45	40
Total	112	100
<5%	39	34
<10%>5%	17	15
<15%>10%	23	21
<20%>15%	15	14
<32%>20%	18	16
Total	112	100

Source: Fieldwork, 2017.

laboratories, and teachers assigned solely for agriculture programmes because most of the year groups do not meet the optimum number of students required for a full class. This contradicts the conditions necessary for CBE to take place, given that agriculture is a vocational course that hinges largely on practical hands-on experience. This situation compromises the effective delivery of CBE. In a key informant interview in a school in Kumasi, the second largest city in Ghana, a teacher indicated that:

> *"Our agriculture class always operate less than the full capacity relative to other courses such as Business, Science and the Arts. The students just lack the interest to pursue agriculture" (Male teacher/Ashanti Region/2017).*

This was corroborated in another interview with a school in Greater Accra. The teacher indicated that:

> *"We always do not get full class size. Even the few who apply to read agriculture tend to change course to pursue other courses. They just use the agriculture programme as a basis to secure admission and change over to other programmes" (Male teacher/Greater Accra Region/2017).*

It is apparent the lack of interest in pursuing agriculture at the senior high school (SHS) level. This has implication for progression to the tertiary level.

4.2. Proportion of total students offering agriculture

The proportion of total students offering specific programmes may have implications on the value that the school administrators, teachers, and even students place on the relevance of the programme. It may also have implications on students' motivation to select and pursue such programmes. The results indicate low enrolment in the agricultural science programme. Specifically, 34% of all the schools offering agriculture had less than 5% of the total student population offering agriculture (Table 1). Senior high school programmes that receive less patronage, are generally perceived to be less relevant and unattractive, parents may be de-motivated to recommend such programmes for their wards. In most cases students whose parents recommended such programmes for their wards did so with the intention of changing to more patronized and attractive programmes once they gained admission to the school. In a key informant interview, a teacher in a school in northern Ghana, indicated that:

> *"Students get discourage when they realise that they are very few in a class and people tend to look down upon them and highly project the science programme as a preferred choice and that is relevant. This has been a common theme since time immemorial" (Male teacher, Northern Region/2017).*

In another key informant interview in a school in Greater Accra, a teacher indicated that:

> *"Students are simply not interested in reading agriculture in the senior high school. They have low self-esteem associated with the course and rather prefer to pursue other courses mostly science and business. If something is not done about this, it may get to a time where senior high schools will not get students pursuing agriculture" (Male teacher, Greater Accra/2017).*

Low student enrollment in agriculture appears widespread in all senior high schools in Ghana. We observed that courses such as science, arts, and business are oversubscribed. In some instances, some prestigious schools in the country deny students the opportunity to pursue science given the high patronage. The low enrolment implies low attention and financial investment in agriculture, leading to under-resourcing of the programme of study in most senior high schools. This contradicts the principles under CBE, specifically the ability to navigate with a small group and large group activities.

Table 2. Facilities available for teaching agriculture

Institutional Facilities	Frequency	Percent (%)
Agriculture Classroom	24	21
Classroom and School Farm	32	29
School Garden	11	10
Agriculture Classroom and School Garden	12	11
Agric Classroom, Agric Lab, And School Farm	9	8
Agric Classroom, Agric Lab, Agric Workshop and Garden	8	7
Agric Classroom, School Farm, And School Garden	10	9
Agric Classroom, Agric Lab, School Farm, School Garden, and Tractor	6	5
Total	**112**	**100**

Source: Fieldwork, 2017.

4.3. Facilities available for teaching agriculture

Table 2 shows the responses from students on existing facilities in their respective schools for teaching agriculture. The results shows that most schools lacked the basic facilities for the teaching, learning and the practice of agriculture. Only 21% of the schools engaged had classrooms dedicated as the only facility for teaching and learning agriculture, such schools further lacked laboratories, school gardens and school farms. Just 29% of the schools had only classroom and school farm, without an agricultural laboratory and school garden. Few schools (10%) had only a school garden with no other facility, including agriculture classrooms. Fewer schools had the ideal context-specific facilities (Agric Classroom, Agric Lab, School Farm, School Garden, and Tractor) for the teaching, learning and practice of agriculture. In an interview with a teacher, he indicated that:

> *"The situation on the ground does not look encouraging, we have to always improvise to make the teaching of agriculture appear interesting. Our school just lacks the needed facilities to teach agriculture. This notwithstanding we are doing our best" (Male teacher/Central Region/2017).*

Using the core principles guiding the practice of CBE in Ghana, we note that adequate infrastructure, workshop(s) equipped with the appropriate tools and equipment, tractors, school, farm, and science laboratory are prerequisites to ensure success. It is therefore worrying that a course that is heavily embedded in practical's, tend to have only 10% of senior high schools having school farms to permit the cultivation of crops and raise livestock. The limited infrastructure, and facilities required of CBE, obliges teachers to divert from the original teaching pedagogy but engaging theory-based approaches that compromises CBE. We find that the current situation in the senior high schools is contrary to the principles of CBE, specifically, Principles 2 & 3.

Indeed, other studies (Anyango et al. (2020), Kanyonga et al. (2019), Karani et al. (2021), Nsengimana et al. (2020)) in Africa support the finding on lack of or inadequate facilities used in teaching agriculture in the SHSs.

4.4. Hands-on experiences

Agriculture is a competence-based course that requires students to engage more in hands-on training in order to acquire the requisite skills and competences. Unfortunately, inadequate facilities make it difficult for the teachers to engage their students in the basic hands-on experiences expected of the programme. Table 3 gives an account of students' responses to

Table 3. Students hands-on experiences

Students Hands- On Experiences	Frequency	Percent (%)
Experiments	18	16
Project Works	10	9
School Farm	16	14
Experiments and Project Work	20	18
Experiments and School Farm	12	11
Project Work and School Farm	8	7
Experiments, Project Work and School Farm	11	10
Experiments, Project Work, School Farm, and Study Trips	10	9
Experiments, Project Work, School Farm, and Study Trips	7	6
Total	**112**	**100**

Source: Fieldwork, 2017.

having hands-on experience in their respective schools. Few (10%) schools engaged their agricultural science students in the full complement of the hands-on training, ie. the exposure and first-hand experiences to laboratory experiment, project work, and school farm (see Table 3). Only 18% of the schools were able to engage the students in experiments and project work only. In the case of the experiments, some of the teachers used their science laboratories to conduct the experiments and not laboratories dedicated for agriculture. In situations where the students lacked the basic hands-on experiences, their motivation to continue lacked agriculture as vocation might get curtailed. Teachers who teach in schools that lack facilities usually change their teaching pedagogy to accommodate the situation. We observed in most cases that, no matter how best teachers tried to modify their teaching pedagogies, theory-based approaches still dominated. In an interview with a teacher, he indicated that:

> *"Given the lack of the requisite facilities to teach agriculture coupled with the low recognition given the programme, we have had to amend our teaching pedagogy to enable students to pass their exams and not necessary transferring practical skills and competencies to the students" (Male teacher/Central Region/2017).*

In another interview in the Northern Region, a teacher indicated that:

> *"Our school is constrained with adequate facilities that enable us to introduce students to hands-on practice. Moreso, the nature of WAEC examination forms the basis of our focus to train students to pass eventually. The exams fail to adequately test for hands-on experience and competence" (Male teacher/Northern Region/2017).*

This was widely reported in most of the key informant interviews held with the teachers. Signifying the magnitude of the challenge in most senior high schools. The implication is that a competence-based course such as agriculture is taught in a way that limits hands-on experience to the practice. The renders students trained not fit for the job market or to come out as entrepreneurs who can make a living from their training. This defeats the core purpose of competence-based education. Specifically, it runs contrary to the core principle of granting students a mastery of the learning, given that the teaching methods simply do not advance this course of action.

Table 4. Teaching experience

Teaching experience		
No. of years teaching	**Frequency**	**Percent (%)**
Less than 1 year	8	3
Less than 5 years	22	9
Between 5 and 10 years	52	22
Between 10 and 15 years	78	33
Above 15 years	78	33
Total	**238**	**100**

Source: Fieldwork, 2017.

4.5. Teaching experience and qualification of teachers

An experienced teacher remains one of the pre-requisites for effective teaching, learning and practice, embedded in a conducive working environment. An experience teacher is able to use available facilities effectively to ensure that students acquire the ultimate benefits of the skills, competences, and learning environment. Table 4 shows that majority (66%) of the teachers teaching agriculture in SHS in Ghana had more than ten years teaching experience. This is an indication of good experience teaching. Therefore, the provision of adequate facilities and the right motivation, can possibly produce the well-baked students with the right competencies. In an interview with a teacher in the Greater Accra region, it came up that:

> *"I have been teaching agriculture for the past fifteen years, in all this years, one thing remains persistent, the lack of facilities to train students with the right skills and competencies in agriculture" (Male teacher/Greater Accra Region/2017).*

In another interview in the central region, a teacher indicated that:

> *"Generally, as you may be aware, the Central Region hosts very good senior high schools in Ghana. I have over twenty (20) years teaching agriculture and integrated science in my school. My experience obviously is not in doubt, but I find myself teaching a course that is supposed to be hands-on in a way that is too theoretical given the examination requirement by WAEC and the limited facilities on campus" (Male teacher/Central Region/2017).*

We find that generally, teachers in most senior high schools have the needed working experience required to teach agriculture—a competence-based course. The teachers however remain handicapped, given the limited facilities available to facilitate the core principles of CBE.

Table 5 shows the subjects that teachers are trained and qualified to teach in pre-tertiary institutions. An appreciable proportion (42%) of teachers are qualified to teach solely agriculture, while 31% are qualified and registered to teach integrated science and agriculture. Only few (8%) are able to teach English and social studies. Generally, teachers trained in agriculture have a background in science and hence, they do not have the capacity and specialization to teach the arts (English and social studies).

Majority (73%) of all the teachers teaching agriculture qualify to teach agriculture in SHS (Table 4). In an interview with a teacher in the Greater Accra Region, he indicated that:

> *"I am a trained graduate from the University of Cape Coast with the right training and knowledge to teach agriculture. I can also boldly say that all my colleagues have the right training and certificates to teach agriculture in the senior high school" (Male teacher/Greater Accra/2017).*

Table 5. Subjects that teachers are qualified and registered to teach

Subjects	Frequency	Percent (%)
Agriculture	100	42
Intergrated Science	26	11
Agriculture and Intergrated Science	74	31
Science and Mathematics	18	8
English and Social Studies	20	8
Total	**238**	**100**

Source: Fieldwork, 2017.

In another interview with a teacher in a senior high school in the northern region, the teacher indicated that:

> *"I have the right training and background to teach agriculture. I have a certificate from the agricultural training institute and I further my education for a degree in agriculture education from the University of Education" (UEW), Mampong Ashanti" (Male teacher/Northern Region/2017).*

Indeed, our engagements with the teachers in key informant interviews and in-class observations proved their academic capacity in teaching agriculture. We observed that even though the teachers had the right teaching experience and qualifications to teach, limited teaching facilities thwart the teaching from being learner-centered. We find that the education delivered appeared largely teacher-centered, contrary to the principles enshrined in the CBE.

4.6. Teachers attitude towards teaching agriculture

The study elicited statements from the teachers to ascertain whether they were happy teaching agriculture in the context of the difficulties that they encountered. On the contrary, 26% of the teachers agreed that they were unhappy teaching agriculture (Table 6). Reasons underlying this, included inadequate facilities, low enrolment, and the lack of recognition of their efforts by parents. Concerning the difficulties in teaching practical skills, a quarter (25%) of the teachers agreed that they had difficulties teaching practical skills, with 15% strongly agreeing (Table 6), yielding a cumulative proportion of 40%. This, therefore, compromises the teaching of competence-based education with theoretical-based ones, with serious implication for the skills and competences expected of the CBE. It remains imperative that the necessary facilities rightly complement CBE. The teachers mentioned inadequate facilities as the primary factor for their difficulties in teaching the practical skills. In an interview with a teacher in Ashanti Region, he indicated that:

Table 6. Ratings of teachers attitude, and difficulties teaching practical agriculture

Ratings of teachers' attitude teaching Agriculture			**Ratings of difficulty teaching practical skills**		
Level of Agreement	**Frequency**	**Percent (%)**	**Level of Agreement**	**Frequency**	**Percent (%)**
Strongly Disagree	124	52	Strongly Disagree	110	46
Disagree	36	15	Disagree	46	19
Neutral	16	7	Neutral	22	9
Agree	14	6	Agree	24	10
Strongly Agree	48	20	Strongly Agree	36	15
Total	**238**	**100**	**Total**	**238**	**100**

Source: Fieldwork, 2017.

> *It is discouraging, the lack of the requisite facilities for teaching and engaging students in practical's for both the learner and the teacher. We do encourage ourselves as teachers hoping that things will get better one day but to me it appears to me that we are hoping against hope (Male teacher/Ashanti Region/2017).*

In another interview with a teacher in the Northern Region, she indicated that:

> *I have been teaching for over five (5) years now and I do not have the needed facilities required to teach the practical skills in agriculture. For instance, the school does not have a farm tractor, we do not have a hatchery for incubating eggs, or producing day old chicks. I always have to improvise as a teacher. Eventually, I have to teach a practical subject in a theory-based approach (Female teacher/Northern Region/2017).*

The above sentiments were widespread in the interviews conducted across the country pointing to the limited facilities required to accompany practical skills and competencies to be lacking. Consequently, students produced may not be ready for the job market. This contradicts the expected principles expected under CBE. A compromise on CBE leads to a duplication of theory-based education that comes has different learning outcomes.

5. Conclusion

The teaching and learning of agriculture in Ghana's pre-tertiary institutions, face a number of challenges which include: inadequate teaching facilities, few dedicated teachers with sole responsibility for teaching agriculture, limited hands-on experiences for students, low enrollment, and demoralised teachers. These challenges make it difficult for the teachers to engage their students in the basic hands-on experiences required for the programme. This negatively impacts the teaching pedagogy, opening door for the domination of the theory-based teaching relative to the much-expected practical training and skills acquisition (competence-based education). This disincentivises a reasonable proportion (26%) of teachers teaching agriculture, making them unhappy teaching based on the difficulties encountered teaching practical agriculture. Ironically, most (51%) teachers have over ten years' experience teaching agriculture coupled with the right qualifications. In summary, Ghana's competence-based education is constrained by limited facilities, which inclines the current educational curricula to be theory-based, thus compromising the needed skills and competencies required of CBE. This situation adversely affects teaching pedagogies to be deficient in hands-on practice, consequently defeating the much desired learner-centered approach.

5.1. Policy recommendation

This paper argues that CBE thrives on adequate and sustained investment in infrastructure, coupled with the provision of the relevant teaching and learning materials that open up the space for more practical work and encourage self-learning. The paper, therefore, makes a strong case for a policy environment that gives priority, especially through adequate budgetary allocation to the Ministry of Education to give true meaning to CBE. This will contribute to resolving the main challenge of inadequate facilities that has saddled the effective implementation of CBE programmes to reverse the tide in teaching pedagogies that inclines towards theory-based approaches.

Additionally, conscious efforts must be made at all levels (basic, primary, senior high and tertiary) to allay the myths, drudgery and low potentials ascribed to the agricultural sector, with an ultimate aim to motivate the youth to pursue agriculture as a career and game-changer in providing self-employment in resolving the high unemployment phenomenon in the sub-region.

Funding
The work was supported by the Economic and Social Research Council (ESRC), (CAPREx) and Alborada Fund

Author details
Seth Dankyi Boateng[1]
Daniel Adu Ankrah[1]
E-mail: dankrah@ug.edu.gh
ORCID ID: http://orcid.org/0000-0001-9360-0854
Seth Awuku Manteaw[2]
[1] Department of Agricultural Extension, School of Agriculture, College of Basic and Applied Sciences (CBAS), University of Ghana, Accra, Ghana.
[2] Council for Scientific and Industrial Research (CSIR), Institute for Scientific and Technological Information (INSTI), PMB, Accra, Ghana.

Disclosure statement
The authors declare that we have no known competing interest.

Citation information
Cite this article as: Competence-based education: reflections on the context of teaching agriculture in Ghana's pre-tertiary schools, Seth Dankyi Boateng, Daniel Adu Ankrah & Seth Awuku Manteaw, *Cogent Education* (2023), 10: 2207793.

Notes
1. CBT and CBE are used interchangeably in this article.
2. This article, however, present findings in Ghana.

References
Acquah, P. C., Frimpong, E. B., & Borkloe, J. K. (2017). The Competency Based Training (CBT) concept of teaching and learning in the Technical Universities in Ghana: Challenges and the Way Forward. *Asia Pacific Journal of Contemporary Education and Communication Technology*, *3*(2), 172–182.
Aduroja, D. (2021 September2021). *What is the role of youth in agriculture? Insights and Analysis*. Heifer International.
Adu-Yebaoh, C., & Kwaah, C. Y. (2018 October-December 2018). Preparing teacher trainees for field experience from on-campus practical experience: Lessons from the on-campus practical experience in colleges of education in Ghana. *SAGE Open*, *8*(4), 215824401880761. https://doi.org/10.1177/2158244018807619
Ampadu, E. (2012). Students' perceptions of their teachers' teaching of Mathematics: The case of Ghana. *International Online Journal of Educational Sciences*, *4*(2), 351–358.
Ankrah, D. A. (2022). Ghana's pineapple innovation history: An account from stakeholders in Nsawam adoagyiri municipal assembly. *African Journal of Science, Technology, Innovation and Development*, *14*(7), 1916–1932. https://doi.org/10.1080/20421338.2021.1988414
Ankrah, D. A., Agyei-Holmes, A., & Boakye, A. A. (2021). Ghana's rice value chain resilience in the context of COVID-19. *Social Sciences & Humanities Open*, *4*(1), 100210. https://doi.org/10.1016/j.ssaho.2021.100210
Anyango, M. N., Odhiambo, A. I., & Janet, W. (2020). Stakeholder consultation and implementation of competency based education programme in public primary schools in Kisumu east sub-county. *Journal of Advances in Education and Philosophy*. 2523-2223. https://doi.org/10.36348/jaep.2020.v04i03.002
Bawakyillenuo, S., Akoto, I. O., Ahiadeke, C., Aryeetey, E. B. D., & Agbe, E. K. (2013). Tertiary education and industrial development in Ghana. In Aryeetey, E.B.D. (Ed.), *Policy Brief* (Vol. 33012, pp. 1–13). Institute of Statistical, Social and Economic Research (ISSER), University of Ghana.
Bizimana, E., Mutangana, D., & Mwesigye, A. (2022). Effects of concept mapping and cooperative mastery learning strategies on students' achievement in photosynthesis and attitudes towards instructional strategies. *International Journal of Learning, Teaching and Educational Research*, *21*(2), 107–132. https://doi.org/10.26803/ijlter.21.2.7
Boahin, P., & Hofman, W. A. (2012). Implementation of innovations in higher education: the case of competency-based training in Ghana. *Innovations in Education and Teaching International*, *49*(3), 283–293. https://doi.org/10.1080/14703297.2012.703021
Cate, T. O., & Schumacher, D. J. (2022). Entrustable professional activities versus competencies and skills: Exploring why different concepts are often conflated. *Advances in Health Sciences Education*, *27*(2), 491–499. https://doi.org/10.1007/s10459-022-10098-7
Chauke, P. K. (2016). Teachers' perceptions on agricultural science curriculum evolvement, infrastructure provision and quality enhancement in Limpopo Province, South Africa. *Infrastructure Provision and Quality Enhancement in Limpopo Province, South Africa*, *14*(1–2), 9. https://doi.org/10.1080/09751122.2016.11890482
Dambudzo, I. I. (2018). Competence based education and training for social economic transformation. *Advances in Social Sciences Research Journal*, *5*(3), 83–94. https://doi.org/10.14738/assrj.53.3867
Diise, A. I., Zakaria, H., & Mohammed, A. A. (2018). Challenges of Teaching and Learning of Agricultural Practical Skills: The case of Deploying Project Method of Teaching among Students of Awe Senior High School in the Upper East Region, Ghana. *International Journal of Agricultural Education and Extension*, *4*(2). 2167-0432.
GEA. (2006). *Ghana Employers Association Annual Report* (Report No. 24). Ghana Employers Association.
Geza, W., Ngidi, M., Ojo, T., Adetoro, A. A., Slotow, R., & Mabhaudhi, T. (2021). Youth participation in agriculture: A scoping review. *Sustainability*, *13*(6), 9120. https://doi.org/10.3390/su13169120
Gondwe, M., & Walenkamp, J. (2011). *Alignment of higher professional education with the needs of the local labour market: the case of Ghana* (Report No. TD/TNC 106.392). Nuffic,The Hague, Netherlands. http://hdl.voced.edu.au/10707/188184
Gravina, E. W. (2017). Competency-based education and its effect on nursing education: A literature review. *Teaching and Learning in Nursing*, *12*(2), 117–121. https://doi.org/10.1016/j.teln.2016.11.004
Gyadu-Asiedu, W., Dzisi, S., Asirifi, P. K., & Boamaa, A. A. (2017). Competency-Based Training (CBT) approach to teaching and learning in Higher Technical Institutions (HTI) in Ghana. *International Journal of Technology and Management Research*, *2*(2), 1–17. https://doi.org/10.47127/ijtmr.v2i2.52
Haddouchane, Z. A., Bakkali, S., Ajana, S., & Gassemi, K. (2017). The application of the competency-based approach to assess the training and employment adequacy problem. *International Journal of Education*, *5*(1), 1–18. https://doi.org/10.5121/ije.2017.5101
Hastie, P., & Saunders, T. E. (2014). Effects of class size and equipment availability on student involvement in physical education. *Journal of Experimental Education*, *59*(3), 212–224. https://doi.org/10.1080/00220973.1991.10806561
Hlophe, N., & Mpandeli, N. S. (2021). The role of small-scale farmers in ensuring food security in Africa. Food security in Africa. https://doi.org/10.5772//intechopen91694

IIEE-UNESCO, (2020). Competence based approach to technical and vocational education and training in Africa, Studies covering seven African countries: Benin, Ethiopia, Ghana, Morocco, Rwanda, Senegal, and South Africa. Ghana County Report IFEF, IIPE-UNESCO Dakar , Senegal.

Ikeda, H., & Matsubara, K. (2017). Development of lesson analysis system for student-centered science teaching towards international cooperation. Conference proceedings edited by Pixel. Florence, Italy. 20–21 March, 2015. ISSN 24209732.

Jennings, G. (2020). An exploration of policy knowledge-seeking on high-volume, low-carbon transport: findings from expert interviews in selected African and South-Asian countries. *Transportation Research Interdisciplinary Perspectives*, *5*,100–117. https://doi.org/10.1016/j.trip.2020.100117

Kamgalawe, C. R. (2019). Assessment used to measure practical skills in competence based curriculum in secondary schools in Temeke district, Tanzania. http://localhost/xmlui/handle/1/6826

Kanyonga, L., Mtana, N., & Wendt, H. (2019). Implementation of competence-based curriculum in technical colleges: The case of Arusha City, Tanzania. *International Journal of Vocational and Technical Education*, *11*(1), 1–20. https://doi.org/10.5897/IJVTE2018.0262

Karani, A., Miriam, K., & Mironga, J. (2021). Teaching competence-based agriculture subject in primary schools in Kenya; a Review of Institutional Preparedness. *International Journal of Education, Technology and Science*, *1*(1), 14–30.

Kayapinar, U. (2014). Measuring essay assessment: Intra-rater and inter-rater reliability. *Eurasian Journal of Educational Research*, *14*(57), 113–135. https://doi.org/10.14689/ejer.2014.57.2

Khanna, R., & Mehrotra, D. (2019). The roadmap for quality improvement from traditional through competency based (CBE) towards outcome based education (OBE) in dentistry. *Journal of Oral Biology and Craniofacial Research*, *9*(2), 139–142. https://doi.org/10.1016/j.jobcr.2019.02.004

Kouwenhoven, W. (2010). Competence-based curriculum development in higher education: Some African experiences. *Access & Expansion: Challenges or Higher Education Improvement in Developing Countries*, 125–146.

Krippendorff, K. (2018). *Content analysis: An introduction to its methodology*. (G.G.E. Barnouw, W. Schramm, T. L. Worth, L. Gross, Eds.). Publications.

Kyule, M. N., Konyango, J. J. J. O., & Nkurumwa, A. O. (2018). Teachers in the implementation of practical agriculture curriculum in Kenya's arid and semi arid secondary schools. *Problems of Education in the 21st Century*, *76*(4), 533–543. https://doi.org/10.33225/pec/18.76.533

Lawyer, B. N. (2021). *Competence-based education and teacher education effectiveness*. Lessons for the University of Buea.

Lewis S. (2015). Qualitative Inquiry and Research Design: Choosing Among Five Approaches. *Health Promotion Practice*, *16*(4), 473–475. https://doi.org/10.1177/1524839915580941

Ministry of Education. (2018). *National Pre-tertiary education curriculum framework for developing subject curricula* (Report No. 003). Ministry of Education.

Mokaya, Z. M. (2013). *Influence of school infrastructure on students' performance in public secondary schools in Kajiado County, Kenya* (Doctoral dissertation, University of Nairobi,).

Moore, T., & Morton, J. (2017). The myth of job readiness? Written communication, employability, and the 'skills gap' in higher education. *Studies in Higher Education*, *42*(3), 591–609. https://doi.org/10.1080/03075079.2015.1067602

Mosha, H. J. (2012, February 12–17). Common core skills for lifelong learning and sustainable development in Africa: A case study of learning materials used to deliver knowledge and skills or competence-based curriculum in Tanzania. A paper presented at the Triennale on education and training in Africa,

Mulder, M. (2012). Competence-based education and training. *The Journal of Agricultural Education and Extension*, *18*(3), 305–314. https://doi.org/10.1080/1389224X.2012.670048

Mulder, M., Gulikers, J., Wesselink, R., & Biemans, H. (2017). Models and principles for designing competence-based curricula, teaching, learning and assessment. In *Competence-based Vocational and Professional Education. In Competence-based Vocational and Professional Education* (Vol. 23, p. 533). Springer Cham. https://doi.org/10.1007/978-3-319-41713-4

Mulder, M., Weigel, T., & Collins, K. (2007). The concept of competence in the development of vocational education and training in selected EU member states: A critical analysis. *Journal of Vocational Education & Training*, *59*(1), 67–88. https://doi.org/10.1080/13636820601145630

Ndihokubwayo, K. (2017). Research on improvised experiment materials for science lessons in Rwanda [Unpublished master's thesis]. Hiroshima University,

Njura, H. J. (2020). Contribution of the Agricultural Teaching Approaches to Food Security: a case of Secondary Schools in Embu County, Kenya (Doctoral dissertation, Universiy of Embu).

Nsengimana, T., Rugema Mugabo, L., Hiroaki, O., & Nkundabakura, P. (2020). Reflection on science competence-based curriculum implementation in Sub-Saharan African countries. *International Journal of Science Education, Part B*, 1–14. https://doi.org/10.1080/21548455.2020.1778210

Odewumi, A. S., & Dekom, H. B. (2020). Competency based education and technical vocational education and training: Implication for sustainable industries and development in Nigeria. *Vocational and Technical Education Journal*, *2*(1), 1–8.

Odukoya, J., Atayero, A., & Olowookere, E. (2014). Development-oriented testing model: Case of the West African examinations council and Cambridge school certificate examinations. Proceedings of INTED 2014 Conference 10th-12th March 2014, Valencia, Spain, pp. 5147–5155

Omae, N. S., Onderi, H., & Benard, M. (2017). Quality implications of learning Infrastructure on performance in secondary education: A small scale Study of a county in Kenya. https://doi.org/10.5281/ZENODO.344956.

Ondieki, C., Kimani, G. N., & Tanui, E. K. (2018). Deficiencies of competency based education and training in higher education institutions in Kenya. https://doi.org/10.21276/sjahss.2018.6.7.13

Ovute, O. A., Alamina, J. I., & Kulu- Uche, N. (2015). Pegagogical practices in the teaching of science in secondary schools in rivers state Nigeria. *Journal of Research in Humanities and Social Science*, *3*(2), 50–55.

Rissanen, I., Kuusisto, E., Tuominen, M., & Tirri, K. (2019). In search of a growth mindset pedagogy: A case study of one teacher's classroom practices in a Finnish elementary school. *Teaching and Teacher*

Education, *77*, 204–213. https://doi.org/10.1016/j.tate.2018.10.002

Rogan, J. M., & Grayson, D. J. (2003). Towards a theory of curriculum implementation with particular reference to science education in developing countries. *International Journal of Science Education*, *25*(10), 1171–1204. https://doi.org/10.1080/09500690210145819

Rufai, A., & Muhammad, U.(2013). Facilities provision and maintenance necessity for effective teaching and learning in technical vocational education. http://repository.futminna.edu.ng:8080/jspui/handle/123456789/2815.

Saldaña, J., & Omasta, M. (2016). *Qualitative Research: Analyzing Life* (S. Helen edited by.). 1st. Sage Publications.

Sanchez-Gracia, & Hernaidez (Eds) (2021). *Sustainable Organisations, Models*, Applications and New Perspectives. https://doi.org/10.577/intechopen.91607

Schweisfurth, M. (2011). Learner-centred education in developing country contexts: From solution to problem? *International Journal of Educational Development*, *31*(5), 425–432. https://doi.org/10.1016/j.ijedudev.2011.03.005

Tarekegn, K., Kamaylo, K., Gatsa, D., Oyka, E., & Panchal, H. (2020). Youth participation in agricultural enterprises as rural job creation work and its determinants in Southern Ethiopia. *Advances in Agriculture*, *2022*, 1–9. https://doi.org/10.1155/2022/60331

Ukonze, J. (2020). Innovative strategy for measuring skill performance of students of agricultural education for sustainable development in Nigeria. *International Journal of Innovative Research and Advanced Studies*, *6*(7), 1–12.

Waymark, M. (1997). The impact of national vocational qualifications on the Secretarial Curriculum. *Journal of Vocational Education & Training*, *49*(1), 107–120. https://doi.org/10.1080/13636829700200008

Wijnia, L., Kunst, E. M., van Woerkom, M., & Poell, R. F. (2016). Team learning and its association with the implementation of competence-based education. *Teaching and Teacher Education*, *56*, 115–126. https://doi.org/10.1016/j.tate.2016.02.006

Wongnaa, C. A., & Boachie, W. K. (2018). Perception and adoption of competency-based training by academics in Ghana. *International Journal of STEM Education*, *5*(1), 1–13. https://doi.org/10.1186/s40594-018-0148-x

Yazdani, A., Hilbrecht, M., Imbeau, D., Bigelow, P., Patrick Neumann, W., Pagell, M., & Wells, R. (2018). Integration of musculoskeletal disorders prevention into management systems: A qualitative study of key informants' perspectives. *Safety Science*, *104*, 110–118. https://doi.org/10.1016/j.ssci.2018.01.004

Yu, T. M., & Chen, C. (2012). Thinking styles and preferred teacher interpersonal behavior among Hong Kong students. *Learning and Individual Differences*, *22*(4), 554–559. https://doi.org/10.1016/j.lindif.2012.02.002