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# Comparison of Colleges of Education (COE) Integrated Science Curriculum Vis-À-Vis the Basic School Integrated Science Curriculum in Ghana

1. Joseph Parker, Enchi College of Education, P. O. Box 44, Enchi. W/R- Ghana
2. Valentina Osei-Himah, Atebubu College of Education, P. O. Box 29, Atebubu. B/A - Ghana
3. Johnson Kofi Ackah, Enchi College of Education, P. O. Box 44, Enchi. W/R- Ghana
4. Isaac Asare, Foso College of Education, P.O. Box 87, Assin Foso. C/R-Ghana

**Abstract**
Science is taught as integrated science in colleges of education, Junior High School (JHS), Upper Primary (Basic 4-6) and Natural Science in Lower Primary (Basic 1-3). Analysis of the colleges of education integrated science curriculum vis-à-vis the basic school syllabus reveals how the subject is structured to prepare teachers to teach it at the basic level. A doctrinal research method design was used for the study. The study revealed that both colleges of education and basic schools Integrated Science curriculum integrate Agriculture, Biology, Chemistry and Physics which aims at giving holistic training to teacher trainees in terms of pedagogical content knowledge, whilst the basic school curriculum aims at achieving scientific and technological literacy. Analysis of both curriculum reveals that some concepts which are very important in contemporary Ghanaian society is left out. It was recommended that there must be a national curriculum review policy on integrated science to merit the needs of society.
**Keywords:** Curriculum, comparison, Syllabus, Integrated Science, Curriculum implementation

There are many common misconceptions of what curriculum is and one of the most common is that curriculum only entails a syllabus. Smith (1996, 2000) says that, "A syllabus will not generally indicate the relative importance of its topics or the order in which they are to be studied. Where people still equate curriculum with a syllabus they are likely to limit their planning to a consideration of the content or the body of knowledge that they wish to transmit". The quality of any educational experience will always depend to a large extent on the individual teacher responsible for it (Kelly, 2009).

Quashigah, Dake, Bekoe, Eshun and Bordoh (2014) citing, MacBeath, Swaffield, Oduro, and Ampah-Mensah (2013) in McWilliam and Kwamena-Poh (1975) state that it was not until the last quarter of the 19th century that Ghana began to take first steps towards a state-organised education. Before then informal systems of education had been the main way in which Ghanaian communities prepared their members for citizenship. It is interesting to note that in Ghana, the first school was the home: the teachers were the parents and the elders in the family. The curriculum was life and learning was by apprenticeship and observation. According to Quashigah et al (2014) citing, MacBeath et al. (2013), the first major purpose of such education was the inculcation of good character and good health in the young members of the community. The second was to give them adequate knowledge of their history, beliefs and culture, thus enabling them to participate fully in social life. According to Antwi (1992), the collectivist nature of education in traditional communities, encompassed the total way of life of the society. It could be seen from the above schools of thought that education prepare individuals to become useful in the society

There have been various reforms that seek to structurally transform the education system and also helped improved considerably access, quality teaching and learning. Aboagye (2002), cited by Quashigah et al (2014) states that the quality of teachers, the quality of education and the quality of teacher education are inseparable. Quality teacher education has been the language of successive governments. This shows how important teacher quality affect educational outcomes in moving the nation forward. Quality of education would be a mirage if the pedagogical content knowledge to be acquired by teacher trainees are overlooked. Hence colleges of education in Ghana should examine the pedagogical content knowledge they take trainees through and priority be given to subjects like Integrated Science geared towards nation building.

As a result of this, a lot of efforts were put in place to train and develop tutors at the colleges of education who were to be the grass root implementers of policies and initiatives of educational improvement and development. For instance, T-TEL activities have been introduced into colleges of education in Ghana to build their capacities to help train teacher trainees holistically.

Despite the various efforts that were put in place, teacher education in Ghana has until recently not attracted much attention by way of intense structural and curriculum reforms. Research conducted by the Centre for Research into Improving the Quality of Primary Education in Ghana (CRIQPEG) at the University of Cape Coast showed that despite the reform efforts, pupils' achievement had not made any significant gains, and was in fact embarrassingly poor (Akyeampong, 2003) cited Quashigah et al (2014). The above gave evidence to the

fact that teacher education having an important role to play in improving and raising the academic standards of education in the country is stuck with challenges.

Integrated Science is one of the subjects taught in colleges of education and student-teachers are prepared to teach it at the basic schools in Ghana. The study of science forms the basis for inventions, for manufacturing and for simple logical thinking and action. This means that scientific and technological literacy is necessary for all individuals, especially in developing countries which have to move faster in the attempt to raise the standard of living of their people. Science is seen as a way of obtaining knowledge through observation and experimentation. At all levels of education, the aim of teaching Integrated Science is to develop scientific literacy.

In Ghana, according to the teaching syllabus for Integrated Science (CRDD, 2010), the subject prepares the individual by equipping him or her with knowledge of scientific and technological literacy. The College of Education Integrated Science curriculum seems not to be in consonance with the Basic School Integrated Science curriculum in Ghana. There was therefore the need to conduct a study that will evaluate the colleges of education (CoE) Integrated Science curriculum vis-à-vis the Basic School Integrated Science curriculum design and implementation in Ghana.

The main aim of the study therefore was to determine whether there are differences in the curriculum of Colleges of Education in relation to how the Integrated Science is structured at the Basic level in Ghana and its relevance in the contemporary Ghanaian society. The question, "are the significant differences in curriculum of Integrated Science in colleges of education in relation to the JHS syllabus in Ghana", guided the study. The research covered only the Integrated Science curriculum at the Colleges of Education and the Basic School Integrated Science syllabus used in Ghana.

Curriculum generally has to do with the answers to such commonplace questions as what can and should be taught to whom, when, and how? (Eisner & Vallance, 1974). As Begg

(2005:6) puts it, curriculum is "all planning for the classroom". This implies that curriculum is to provide a template or design which enables learning to take place. It defines the learning that is expected to take place during a course or programme of study in terms of knowledge, skills and attitudes. It should specify the main teaching, learning and assessment methods and provide an indication of the learning resources required to support the effective delivery of the course. A curriculum is more than a syllabus. According to Whitson (2007), a syllabus describes the content of a programme and can be seen as one part of a curriculum. Most curricula are not developed from scratch and all operate within organisational and societal constraints. Since teacher-trainees use the curriculum in their teaching practice, it makes sense to appraise the College of Education (CoE) Integrated Science curriculum in relation to the Basic School Integrated Science curriculum in Ghana and its relevance to society.

According to Quashigah, Eshun and Mensah (2013: 84-85) teachers need to be reminded of their primary function which is to facilitate learning and if this will be possible they have to be familiar with the major objectives in their subject areas and to practice formulating objectives in all the domains of learning for specific topics following the different classifications by Bloom (1956), Krathwohl (1956) and Taba (1962).

Teachers' conception represents part of teachers' mental contents or schemas that influence approaches and practice of teaching (Ernest, 1989). It is in this light that, the comparison of College of Education (CoE) Integrated Science curriculum vis-à-vis the Basic School Integrated Science curriculum and its relevance in Ghana is worthy of an academic discourse. The number of colleges of education in Ghana now stands at 46, and they are expected to train about 15,000 teachers annually. These teachers are expected to teach various subjects including Integrated Science at the basic level of education. Products of the colleges of education, thus, have a responsibility of laying a firm and sound foundation in the educational career of the young ones entrusted into their care. This implies that teacher quality at the colleges of education need not be taken for granted if quality trained Integrated Science teachers are to be produced from the colleges.

Research studies (Thompson, 1992) conclude that teachers' conception of a subject or a curriculum would shape their perceived curriculum and therefore their implemented curriculum. This implies that teachers' conception is of high essence in the implementation process. Indeed, the importance of the teacher in the successful implementation of curriculum reform has been revealed in studies both in the West (i.e. Fullan, 2001) and the East (Adamson, Kwan, & Chan, 2000).

In general, studies of teachers' understanding of the subjects they teach have shown those conceptions affect the way they teach and assess (Ertmer, 2005; Prosser, Martin, Trigwell, Ramsden, & Lueckenhausen, 2005; Bekoe & Eshun, 2013; Quashigah et al., 2013). These implicit orientations to curriculum shape the topics teachers emphasise and the meaning teachers give to curriculum documents. Cheung and Wong (2002) have argued that teachers' conceptions of curriculum affect the content of curriculum implementation.

It is important that a classroom practitioner knows what is involved in implementing the prescribed curriculum. Curriculum implementation entails putting into practice the officially prescribed courses of study, syllabuses and subjects (Urevbu, 1985). Putting a curriculum into operation requires an implementing agent.

Implementation takes place when the teacher-constructed syllabus, the teacher's personality, the teaching materials and the teaching environment interact with the learner (University of Zimbabwe, 1995:9). Curriculum implementation therefore refers to how the planned or officially designed course of study is translated by the teacher into schemes of work and lessons to be delivered to students.

**Methodology**

A doctrinal method of research design was adopted to compare the relationship between the Integrated Science curriculum of the College of Education vis-à-vis the Basic School syllabus. Curricula documents on Integrated Science of the College of Education and that of the Basic School were used. This was based on the two comparative analysis process created by the researchers: (1) The course description and objectives for offering Integrated Science programme at Colleges of Education vis-à-vis the rational and objectives of the JHS syllabus; and (2) Content and nature of the College of Education Integrated Science vis-à-vis the Basic School syllabus. It is a purely documentary analysis of curricula documents. . The researchers, thus, compared documents from colleges of education and the basic schools syllabus to ascertain how the Integrated Science curriculum has been structured at these two levels and its relevance to Ghanaian society.

**Findings and Discussions**

This section presents the findings and the resulting discussions of the study. The presentation is done under two main areas; the rationale and objectives of Integrated Science at the CoE and the Basic School levels in Ghana, and the Contents of the Integrated Science Curricula at the CoE and the Basic School levels in Ghana.

**Rationale and Objectives of Integrated Science in the Colleges of Education and the Basic Schools in Ghana.**

An analysis of curricula documents of Integrated Science at these two levels of education in Ghana reveals that the Integrated Science curriculum at the college of education was developed under the supervision of the Institute of Education-University of Cape Coast, whereas the Basic School Integrated Science curriculum was prepared by the Curriculum Research and Development Division (CRDD) of the Ghana Education Service (GES). Integrated Science is studied for four semesters at the College of Education with the following as the descriptions and objectives of the various courses, from Year 1 to Year 2.

**Year 1, Semester 1**

The course is designed to consolidate the content and skills students have acquired from lessons in Integrated Science at the Senior Secondary School level. It covers the following areas: Nature of Soil, Hazards, Vegetable crop production, Fish culture, Farming systems, Structure and function of the cell, Respiratory system in humans, Structure and functions of flowering plants, Ecosystem, Element, Compounds and Mixture, Solutions, Measurements, Energy, Work and Power.

**The objectives are to**: "make students awareness (1) the nature and importance of soil and soil profile in crop production, 2) the term hazard, 3) warning and safety signs, 4) the principles in vegetable crop production, 5) crops according to their lifespan and uses, 6)the importance of vegetable crops to humans, 7) the factors influencing vegetable crop production, 8) main parts of a fish and the importance of fish farming, 9) the conditions suitable for rearing Tilapia, 10) activities involved in rearing Tilapia, 11) various farming systems, 12) the advantages and disadvantages of types of farming systems, 13) a plan for a crop rotation programme, 14) the structure of the cell and cell theory, 15) the respiratory system and 16) structure of flowering plants."

**Year 1, Semester 2**

The course is designed to consolidate the content and skills students have acquired from lessons in Integrated Science at the Senior Secondary School level. It also examine Climate and Agriculture, Pests and parasites, Soil and water conservation, Animal production, Digestion in farm animals, Farm Machinery, reproduction and Growth in Humans, Heredity, Diffusion and Osmosis in plants and animals, Circulatory system in Humans, Food and Nutrition in plants and animals and Infection and diseases. It emphasises the holistic approach to relevant issues in society such as controlling and preventing diseases.

The objectives are to: "make students awareness on, 1) weather and climate, 2) the elements of climate, 3) identify weather measuring equipment, 4) the effects of the elements of climate on agriculture, 5) pests, parasites and vectors. 6) methods of controlling diseases, pests and parasites, 7) the factors which lead to the depletion of soil resources, 8) the effects of erosion on farming and the environment, 9) prevention and control soil erosion, 10) the application of fertilizers in farming, 11) principles of animal production, 12) the parts of the digestive system and state their functions, 13) the digestive systems of Monogastrics and Ruminants, 14) the changes that occur to different food substances as they pass through the alimentary canal, 15) how undigested food substances are eliminated from the body, 16) some machinery and their uses in agriculture, 17) reproduction and growth in

 

humans and heredity, 18) diffusion and osmosis in plants and animals and circulatory system in humans."

**Year 2, Semester 1**

The course description is intended to provide basic knowledge and practice in the use of effective methods in the teaching and learning of science. Students will be exposed to good practices in the teaching and learning of science. It brings to the fore the meaning of methods, techniques and strategies used in teaching the subject. It also looks at the various teaching methods such as, role-playing, simulation, discussion and demonstration, discovery, field trip, project, question and answer, activity and game method of teaching. It also emphasises the need for other resources such as resource room, resource person and community resource, improvisation that go to enhance teaching and learning. It finally affords the student the opportunity to plan lessons on given topics in the subject".

The objectives are to: "make students awareness on, 1) effective skills needed to promote the teaching and learning of science, 2) of possible hazards in science classes and adopt safety measures, 3) good practices in science teaching and learning, 4) basic skills in First Aid treatment, 5) skills in using basic school science curriculum materials for lesson planning and delivery, and 8) the appropriate TLMs in the teaching and learning of science

**Year 2, Semester 2**

The course is designed to consolidate the content and skills students have acquired from lessons in Integrated Science at the Senior Secondary School level. It examines; - Life cycle of a mosquito, Dentition in humans, Digestion in humans, Acid, base, salt and indicators, Second Energy, Heat Energy, Magnetism, Electricity, Basic Electronics. It emphasises holistic approach to relevant issues in society such as controlling and preventing diseases.

**The objectives are to**: "make students awareness on, 1) identify methods of controlling the mosquito, 2) state the types of teeth and functions of the different types of teeth, 3) dental care (plaque) tooth decay and gum disease and prevention, 4) diseases associated the digestive system in humans, 5) Acids, Bases and Salts with respect to: Arrhenius, lewis, Bronsted-Lowey, 6) sources of Sound waves, Heat and Electricity, 7) magnetic and non-magnetic materials, and 8) construction of simple electronic circuit.

Integrated Science at the Basic School level has as its rationale as developing scientific literacy for every Ghanaian citizen, a requirement that will result in the creation of a scientific culture in line with the country's strategic programme of achieving scientific and technological literacy in the shortest possible time. The study of Integrated Science prepare the individual by equipping him or her with scientific knowledge. As a subject, Integrated Science should help pupils/students to understand their society better; helps them to investigate how their society functions and hence assists them to develop that critical and at the same time develop a kind of attitude that will transform societies (CRDD, 2007).

**The general aims of Integrated Science at the Basic School**

The syllabus is designed to help the pupil to: 1) develop the spirit of curiosity, creativity and critical thinking. 2) develop skills, habits of mind and attitudes necessary for scientific inquiry.

3) develop the spirit of curiosity for investigating and understanding their environment 4) communicate scientific ideas effectively, 5) use scientific concepts for explaining their own lives and the world around them. Others include, 6) live a healthy quality life, 7) treat all resources of the world with humane and responsible attitude, 8) show concern and understanding of the interdependence of all living things and the Earth on which they live, 9) design activities for exploring and applying scientific ideas and concepts.

The content of Integrated Science curriculum at the basic level covers the following areas; Introduction to Integrated Science, Matter, Measurement, Nature of Soil, Hazards, Elements, Compounds and Mixtures, Metals and Non Metals, Chemical Compounds, Water, Acids, Bases and Salts, Soil and Water Conservation, Life Cycle of Flowering Plants, Vegetable Crop Production, Fish Culture, Carbon Cycle, Climate, Life Cycle of the Mosquito, Animal Production, Respiratory System of Humans, Farming Systems, Reproduction and Growth in Humans, Heredity, Diffusion and Osmosis, Circulatory System in Humans, Solar System, Dentition in Humans, Digestion in Animals, Sources and Forms of Energy, Conversion of Energy, Basic Electronics, Light Energy, Photosynthesis, Food and Nutrition, Electrical Energy, Heat Energy, Ecosystems, Physical and Chemical Changes, Infections and Diseases, Pests and Parasites, Force and Pressure, Machines, Magnetism, Technology and Development, Machinery, Entrepreneurship.

When the above scope and objectives are matched with the courses under the Integrated Science curriculum at colleges of education, it can be said that they are related in majority of the cases. There are however no Entrepreurship and Technology and Development related courses in the CoE Integrated Science curriculum that will help teacher trainees to teach effectively at the Basic School level.

Also both curriculum have failed to address the current societal problems and needs. For example, how to

reclaim the activities of illegal mining activities locally known as 'Galamesey' and now that Ghana has discovered oil in commercial quantity, the two curriculum are salient on organic compound making it difficult to appreciate the impact of oil discovery on current and future development efforts of the country.

**Conclusions**

The study revealed that: colleges of education integrated science curriculum integrate Agriculture science, Biology, Chemistry and Physics which aims at giving holistic training to teacher trainees in terms of pedagogical content knowledge to be able to teach effectively after completion, whilst the basic school curriculum is the fusion of the major branches of science which seeks to address the country's strategic programme of achieving scientific and technological literacy in the shortest possible time. Its study at the basic education level will equip the young person with the necessary process skills and attitudes that will provide a strong foundation for further study in science. Analysis of both curriculum reveals that some concepts which are very important in contemporary in the Ghanaian society is left out. Analysis of the Integrated Science curriculum at colleges of education and the basic school level reveals that, they are related in majority of the cases. There are however no Entrepreurship and Technology and Development related courses in the CoE Integrated Science curriculum that will help teacher trainees to teach effectively at the Basic School level.

Also both curriculum have failed to address the current societal problems and needs. For example, how to reclaim the land after illegal mining activities locally known as 'Galamesey' and now that Ghana has discovered oil in commercial quantity, the two curriculum are salient on organic compound making it difficult to appreciate the impact of oil discovery on current and future development efforts of the country. The foregoing implies that a gap is being created in the knowledge and the ideal practices of newly qualified teachers from the colleges of education. It was recommended that there must be a national curriculum policy on integrated science, that all pathways to teaching of the subject should undergo review according to such national standards to merit the needs of society. There is also the need for a quality assurance mechanism like teacher Licensing and professional teaching standards be instituted in the teaching profession to ensure that teacher preparation programmes in the country are designed to focus on the needs of society.

**References**

Aboagye, J. K. (2002). *Historical and philosophical foundations of education in Ghana.* Accra: Media Guard Ltd.

Adamson, B., Kwan, T., & Chan, K. K. (2000). *Changing the curriculum: The impact of reform on primary schooling in Hong Kong.* Hong Kong: Hong Kong University Press.

Akyeampong, K. (2003). *Teacher training in Ghana-Does it count?*-Multi-Site Teacher Education Research Project (MUSTER) Ghana study; Country Report One. Washington D. C.: World Bank.

Antwi, M. (1992). *Education, society and development in Ghana.* Accra: Unimax Publishers Limited.

Begg, A. (2005). Why curriculum matters to me. *Curriculum Matters, 1*, 1-11.

*Bekoe, S. O., & Eshun, I. (2013b).* Exploring social studies teachers' conceptions on nature and content of Social Studies in Senior High Schools in the Central Region of Ghana. *Research on Humanities and Social Sciences, 3*(5), 85-95.

Cheung, D., & Wong, H. W. (2002). Measuring teacher beliefs about alternative curriculum designs. *The Curriculum Journal, 13*(2), 225-248.

CRDD (2010). *Integrated Science teaching syllabus for Junior High Schools.* Accra: Ministry of Education.

CRDD (2007). *Integrated Science teaching syllabus for Junior High Schools.* Accra: Ministry of Education.

Eisner, E. W., & Vallance, E. (1974). *Five conceptions of curriculum: Their roots and implications for curriculum planning.* In E. W. Eisner & E. Vallance (Eds.), Conflicting conceptions of curriculum. Berkeley, California: McCutchan Publishing Corp. Pp. 1-18.

Ernest, P. (1989). *The impact of beliefs on the teaching of mathematics.* In P. Ernest (Ed.), Mathematics teaching: The state of the art. New York: Falmer Press. Pp. 249–253.

Ertmer, P. A. (2005). Teacher pedagogical beliefs: The final frontier in our quest for technology integration? *Educational Technology Research and Development, 53*(4), 25-39.

Fullan, M. (2001). *The new meaning of educational change (3rd ed.)*. New York: Teachers College Press.

Kelly, A. V. (2009). *The curriculum: Theory and practice* (pp. 1–55). Newbury Park, CA: Sage.

Institute of Education (2014). *Three Year Diploma in Basic Education Five-Semester Pprogramme Revised Syllabus*. UCC: Ghana.

MacBeath, J., Swaffield, S., Oduro, G., & Ampah-Mensah, A (2013). *Building leadership capacity, enhancing learning and teaching in Ghanaian basic schools.* In J. MacBeath &M.

McWilliam, H. O. A., & Kwamena-Poh, M. A. (1975). *The development of education in Ghana.*London: Longman Green Co. Ltd.

Prosser, M., Martin, E., Trigwell, K., Ramsden, P., & Lueckenhausen, G. (2005). Academics' experiences of

 

understanding of their subject matter and the relationship of this to their experiences of teaching and learning. *Instructional Science, 33*, 137-157.

Quashigah, A. Y., Dake, G. Y., Bekoe, S. O., 4. Eshun, I. & Bordoh, A. (2014). Evaluation of Colleges of Education (CoE) Social Studies Curriculum vis-à-vis the Junior High School (JHS) Social Studies Curriculum in Ghana. *European Journal of Training and Development Studies 2*(1), 1-13.

Quashigah, A. Y., Eshun, I., & Mensah, M. F. (2013*).* Influences of the pedagogical content knowledge of graduate social studies teachers on questions they set in Senior High Schools in Ghana. *Research on Humanities and Social Sciences, 3*(6), 76-86.

Thompson, A. G. (1992). *Teachers' beliefs and conceptions:* A synthesis of the research. In D. A. Grouws (Ed.), Handbook of research on mathematics teaching and learning. New York: MacMillan. Pp. 127-146.

University of Zimbabwe, (1995). *Curriculum implementation, change and innovation.* Harare: Centre for Distance Education, University of Zimbabwe. Module EA3AD 303.

Urevbu, A. O. (1985). *Curriculum studies.* Ikeja: Longman.

Whitson, J. A. (2007*). Conceptions of curriculum.* Retrieved on January 26, 2014, from http://curricublog.org/conceptions-of-

Smith, M. K. (1996, 2000). '*Curriculum theory and practice' the encyclopedia of informal education,* www.infed.org/biblio/b-curric.htm.