An Appraisal of Networking Influences on Effective Teaching and Learning of Food and Nutrition

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ABSTRACT

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| **Aim:** The study aimed to investigate networking in food and nutrition education at colleges in Ghana to ensure effective teaching and learning. This study was anchored on Behaviourist Theory**Study design:** Quantitatively, the study adopted a cross-sectional survey research design.**Place and Duration of Study:** The study aimed to investigate networking in food and nutrition education in colleges in Ghana to ensure effective teaching and learning.**Methodology:** The study population includes fourteen (14) public Colleges of Education in Ghana offering Food and Nutrition. Stratified, simple random, and census sampling techniques were used to select the 14 colleges, 16 tutors, and 256 students as participants. The main instrument for data collection was a questionnaire. The data collected were processed and analysed using correlation analysis and regression analysis.**Results:** The study on the influence of networking on effective teaching and learning of Food and Nutrition revealed that both tutors and students agreed on the positive impact of networking on various educational outcomes. Key findings include that networking fosters self-paced learning enhance student interest and motivation, promotes complex understanding, and aids in achieving learning outcomes, all with overall means above the predetermined cut-off of 3.0. Additionally, networking inspires enthusiasm, as tutors encourage questions and support critical thinking, contributing to effective student engagement. Proper organization of teaching, including timely lectures and clear explanations, further facilitated effective learning experiences.**Conclusion:** Networking in Food and Nutrition education promotes learning, inspires enthusiasm, ensures proper organisation and group interaction, and helps achieve breadth of syllabus. It can expediently conclude that sharing what is learnt, sharing what is created, encouraging positive contributions from each other, maintaining contacts with students in the team, and consistently utilising networking in the teaching-learning process can help sustain networking in Food and Nutrition Education in Colleges of Education in Ghana. |

***Keywords****: Networking, Food, Nutrition, Teaching and Learning*

1. INTRODUCTION

Assessment has become the foundation of all levels of education (Bordoh, 2023). This will enhance attitude change instruction in education, emphasising the importance of teacher commitment, student engagement, and a supportive educational environment **(**Appiah-Kubi, Bordoh, & Eshun, 2024). Food and nutrition education is the educational process that prepares individuals for successful family and community living (Khaleel, 2012). It impacts in man an all-round successful development which is aimed at improving man’s quality of life. In an ever-changing and ever-challenging environment that puts at centre stage issues such as food security, health, sustainability, consumer excesses and a widening poverty gap, one of Food and Nutrition Education’s unique strengths is that it prepares students to respond to a range of real-life challenges in relation with the food they consume. In facing these real-life challenges, food and nutrition tutors have a role to play. They are to ensure that students are provided with information about knowledge and skills, the relationship between good diet, physical activity and health, teaching students how to prepare food and conserve nutrients, and help to differentiate between healthy and unhealthy food choices, among others (Hawkes, 2013). Background knowledge of teachers in using techniques and strategies assessing concepts in Ghana has become necessary to build Ghanaian society better and faster growth in development (**Bordoh,**  Kwarteng, Osman, Bakar, Brew, Ibrahim, & Bassaw, 2018).

Colleges of Education have been confronted with reforms that pertain to changing curriculum frameworks, new teacher professional development designs and tutors' changing roles (Khaleel, 2012). More specifically, reforms that underlie the increase in collective action between tutors comprise collective teaching, coherence between subject areas and distributed decision-making. These reforms call for consultation and coordination between tutors. Teachers must share responsibility and authority for decision-making about their everyday practices (Hargreaves & Dawe, 1990). Given this, ongoing collaboration between tutors has become more important. Besides, tutor collaboration has received more attention from scholars as tutors work less isolated nowadays (Hargreaves & Dawe, 1990). Several scholars and reformers have called for the strengthening of collaboration between tutors by promoting networking in schools and colleges (Levine & Marcus, 2010; James et al., 2007). This requires a resourceful teacher to handle the modern teaching techniques and strategies that promote the teaching and learning of concepts **(Bordoh,** Eshun, Kwarteng, Osman, Brew, &Bakar, 2018). This indicates that teachers with good content knowledge impact their teaching to develop students' attitudes, skills, values and knowledge (Kankam, **Bordoh**., Eshun, Bassaw, & Andoh-Mensah. (2014).

According to Louis *et al.* (1996), networking among tutors refers to collectively engaging in sustained efforts to improve practices. Networking is important because it fosters collaboration than an occasional exchange between tutors. Besides, tutor collaboration is seen to fix into the culture of the school and for that matter, colleges (Vescio *et al.,* 2008). This is captured by Bolam *et al.* (2005), where tutors reported an increase in collaboration as they networked. They however suggest that, networking is a promising context for stimulating ongoing collaboration between tutors and embedding collaboration into the school culture.

Despite the growing awareness of the potentially strong role of networking, the research base on networking is rare (Imants, 2003; Westheimer, 1999). This, according to some scholars, is a result of a lack of conceptual clarity on networking, which results in the varying views on networking among scholars, leading to a small consensus among teachers and administrators as to whether networking occurs within their schools and colleges (Westheimer, 1999; Vescio *et al.,* 2008). Again, there seems to be no empirical research about networking in schools and colleges (Wertheimer, 1999).

Formal professional development tends to be a top/down approach, with internal or external ‘experts’ presenting to a relatively passive and unengaged audience (Australian Institute for Teaching and School Leadership [AITSL], 2011). McDonald (2012) observed that teaching has been too private for too long. Lectures are conducted behind closed lecture room doors, although academics have generally been exposed to ideas about improving their methodology (Bouchamma & Michaud, 2011). According to them, many have lacked the support of networking to help them implement new ideas to improve the quality of teaching. It can be concluded that both tutors and students are in favour of networking in Food and Nutrition education. The tutors and students believed networking education can foster collaboration, help implement new ideas to improve the quality of teaching, create an environment conducive to teaching and learning; and help students in sharing vital information. Since there is a positive perception of the use of networking, it is recommended that the tutors foster collaboration and create a conducive environment to enhance the positive perception and smooth implementation of networking in Food and Nutrition education at Colleges of Education in Ghana. The study indicated that to sustain networking education, teachers need to be more cognizant of their interactions and their influence on students. It is therefore recommended that teachers maintain contact with students and ensure a spirit of unity in diversity among the students (Nyadroh, 2023).

Previous studies have left several gaps to be filled. First, most studies on teachers' and students’ networks in teaching have been conducted in developed countries. In contrast, it appears clearly that there have been a limited number of publications reporting on this issue for developing countries like Ghana. Second, in the Ghanaian context, the previous studies that focused on teachers networking with students in teaching and learning (Tamakloe et al., 2005; Sekyi-Acquah, 2009; Babb, 2019) also could not fill in all gaps. For instance, Tamakloe et al. (2005) study focused on the interaction between tutors and students as teaching methods. Sekyi-Acquah’s (2009) study on Economics students’ rating of Economics teachers’ effectiveness summarized teacher network as a strategy for improving student and teacher interaction. Babb (2019) assessed the impact of the Practical Education Network (PEN) on teachers and students in the classroom. As a result, those studies were not aimed at, nor did they fully reveal how tutors and students networking empowered teaching and learning.Also, these studies were not focused on effective teaching in Food and Nutrition. Therefore, this study sought to fill the gap by investigating the influence of networking on effective teaching in Food and Nutrition in Colleges of Education in Ghana. The study aimed to investigate networking in food and nutrition education at colleges in Ghana to ensure effective teaching and learning. The study was guided by this research question: To what extent does the use of networking influence effective teaching and learning about food and nutrition?

**1.1 Behaviourist Theory**

This study was anchored on Behaviourist Theory. Behaviourism theory views learning and education as the change in behaviours of an individual, and throughout the process, it involves some exploration, trial and error until a positive event occurs. Behaviourists pay no attention to what is happening inside the learner as, according to their point of view, what is happening inside is not available to be observed directly (Mecca, 1994).  According to Sho (2019), behaviourism is a systematic approach to understanding the behaviour of humans and other animals. It assumes that behaviour is either a reflex evoked by the pairing of certain antecedent stimuli in the environment or a consequence of that individual's history, including especially reinforcement and punishment contingencies, together with the individual's current motivational state and controlling stimuli. Although behaviourists generally accept the important role of heredity in determining behaviour, they focus primarily on environmental events.

Behaviourist theory combines elements of philosophy, methodology, and theory. Behaviourism emerged in the early 1900s as a reaction to depth and other traditional forms of psychology, which often had difficulty making predictions that could be tested experimentally, but derived from earlier research in the late nineteenth century, such as when Edward Thorndike pioneered the law effect, a procedure that involved the use of consequences to strengthen or weaken behaviour. With a 1924 publication, John B. Watson devised methodological behaviourism, which rejected introspective method and sought to understand behaviour by only measuring observable behaviours and events (Skinner, 1968). It was not until the 1930s that B.F. Skinner suggested that covert behaviour, including cognition and emotions, is subject to the same controlling variables as observable behaviour, which became the basis for his philosophy called radical behaviourism (Skinner, 1968).  While Watson and Ivan Pavlov investigated how (conditioned) neutral stimuli elicit reflexes in respondent conditioning, Skinner assessed the reinforcement histories of the discriminative (antecedent) stimuli that emits behaviour; the technique became known as operant conditioning.

In the classroom, the behavioural learning theory is key in understanding how to motivate and help students. Information is transferred from teachers to learners from a response to the right stimulus. Students are a passive participant in behavioural learning teachers are giving them the information as an element of stimulus-response (Wenger *et al.*, 2002). Teachers use behaviourism to show students how they should react and respond to certain stimuli. This needs to be done in a repetitive way, to regularly remind students what behaviour a teacher is looking for.  Positive reinforcement is key in the behavioural learning theory. Without positive reinforcement, students will quickly abandon their responses because they don’t appear to be working. Repetition and positive reinforcement go hand-in-hand with the behavioural learning theory. Teachers often work to strike the right balance of repeating the situation and having the positive reinforcement come to show students why they should continue that behaviour (Curzon, 1993).

Motivation plays an important role in behavioural learning. Positive and negative reinforcement can be motivators for students. For instance, a student who receives praise for a good test score is much more likely to learn the answers effectively than a student who receives no praise for a good test score (Hartley, 1998). The student who receives no praise is experiencing negative reinforcement-their brain tells them that though they got a good grade, it did not really matter, so the material of the test becomes unimportant to them. Conversely students who receive positive reinforcement see a direct correlation to continuing excellence, completely based on that response to a positive stimulus.

The behavioural learning theory and the social learning theory stem from similar ideas. The social learning theory agrees with the behavioural learning theory about outside influences on behaviour. However, the social learning theory goes a step further and suggests that internal psychological processes are also an influence on behaviour. Students or individuals may see things being done, but the social learning theory says that internal thoughts impact what behaviour response comes out (Weeger, 2012).  Behaviourism does not study or feature internal thought processes as an element of actions. Social learning argues that behaviour is much more complicated than the simple stimulus and response of behaviourism. It suggests that students learn through observation, and then they consciously decide to imitate behaviour. Teachers can implement behavioural learning strategy techniques in their classroom in many ways, including:

* Teachers may practice skills using drill patterns to help students see the repetition and reinforcement that behavioural learning theory uses.
* Teachers can use a question as a stimulus and answer as a response, gradually getting harder with questions to help students.
* Teachers can be directly involved in helping students go through problems to give them the reinforcement and behaviour demonstration you want them to follow.
* Reviews are important to behavioural learning theory. Going back over material and giving positive reinforcement will help students retain information much better.
* Positive reinforcement. Behaviourist classrooms utilize positive reinforcement regularly. This can be in the form of verbal reinforcement and praise, reward systems, added privileges, and more.

In the context of this study, tutors of Food and Nutrition know that they will usually have a student in class who is difficult to manage and work with. Their behaviour is usually hard to control and it can be extra work to get them to pay attention and stop distracting others. Additionally, networking among tutors and students will help how the students learn. Behaviourist theory in conjunction with networking will improve the studying behaviour of students toward Food and Nutrition. Behaviourism focuses on the idea that all behaviours are learned through interaction with the environment. This implies that positive behaviour of students towards Food and Nutrition from the application of educational networking, since innate or inherited factors have very little influence on student’s behaviour.

**1.2 Influence of Networking on Effective Teaching and Learning**

Teachers' beliefs and practices are significant in understanding and enhancing educational processes (Knapp, 2003). This implies that teachers' teaching effectiveness leads to their general performance in planning and preparation, instructional skills, classroom management, communication and assessment skills (Bordoh, Nyantakyi, Otoo, Boakyewa, Owusu-Ansah, & Eshun, 2021). They are inextricably tied to teachers' coping methods in their everyday professional lives and overall well-being, and they impact students' learning environments and influence student motivation and accomplishment. This serves as a benchmark for classroom assessment. This shows that assessment for learning is a gradual engagement that takes place endlessly throughout ongoing classroom learning activities to offer immediate feedback for assessors and assesses to close the gap identified in the ongoing learning situation (**Bordoh,** 2023).

 Educational networks positively impact student behaviour in the classroom. The learning environment plays a significant role in developing a student’s motivation to learn, and positive relationships can help maintain student interest and active engagement in learning (Maulana et al., 2013). On the other hand, if the foundation for networking between teachers and students is lacking, it will negatively impact student behaviours. Students will resist rules and procedures, and they will neither trust teachers nor listen to what they have to say if they sense teachers do not value or respect them (Boynton & Boynton, 2005).

To reiterate self-determination theory, students need to experience an emotional involvement from their teachers. Furthermore, students who have good network with teachers are less likely to avoid school (Rimm-Kaufman & Sandilos, 2012). Experiencing a sense of belonging dramatically contributes to developing positive relationships and behaviours. The nature of the teacher and student network shapes the quality of the relationships; teachers tend to have more negative interactions with students who are peer-rejected or less academically and behaviourally competent. Unfortunately, this interaction not only impacts the teacher's relationship with the student but also affects how the student’s peers view him; this negative interaction can influence other classroom relationships (Jerome & Pianta, 2008). In order to correct this, teachers need to be more cognizant of their interactions and their influence on students. Teachers should be aware that educational networking predicts school adjustment and may serve as a defensive factor for children at high risk of poor school and development outcomes (Lander, 2009).

According to Skinner and Greene (2008), when a teacher creates a welcoming environment and considers the needs of the students through educational networking, learning outcomes will be ideal, students will effectively perform tasks they find personally important or interesting. Creating a climate of warmth and caring as well as supporting autonomy and self-determination will help students feel a sense of control (Skinner & Greene, 2008). All students should have a respectful, caring, and positive learning environment that enhances the joy of learning. The nature of the classroom environment has a powerful influence on how well students achieve educational outcomes (Asiyai, 2014).

Baker-Doyle and Yoon (2010) indicated the importance of teacher-to-student networking to support instructional improvement. Generally, teachers and students benefit as active contributors during teaching and learning (Calvert, 2016). Teachers and students may develop more confidence and expertise in their practice through collaboration and knowledge sharing in collegial interactions (Darling-Hammond et al., 2009; Killion, 2014). Successful teacher-student collaboration may encourage students and teachers to share, reflect, and take risks necessary to change their practice (Vescio, Ross, & Adams, 2008). Further, collaborative and collegial environments may help sustain teachers’ professional learning beyond one-off professional development sessions (Cohen, Moeller, & Cerrone, 2015; Stoll, Bolam, McMahon, Wallace & Thomas, 2006). The teacher-to-students teaching and learning activities in the logic model leverage teacher leadership roles, which can serve as a mechanism to provide professional development for teacher leaders themselves (Wilson, 2016).

Previous research has found that teachers can benefit from learning from each other through mentoring and peer coaching (Cohen et al., 2015; Wei et al., 2009). The network program can help teachers adapt instructional materials, practices, and content given their contexts (Gamrat, Zimmerman, Dudek, & Peck, 2014). By integrating teacher collaboration, a teacher leadership role, and flexibility to allow teacher choice in the learning and adaptation to the local school context, network programs are hypothesised to hold direct benefits for core teachers extending through their schools. A study by Nee (2014) on the impacts of incorporating educational network into a classroom setting showed that educational networking ensures effective teaching and learning. Nee indicated that educational network fosters self-paced learning, get rid of boredom, promote better complex conceptual understanding, improve students’ interest and motivation, expose students to extra information, and enhance communication and interactivity. The results indicated that students that were instructed by the instruction with intervention performed a larger on the gain scores of all the three cognitive levels; than those instructed by the conventional approaches. Educational network will permeate all facets of the curriculum as a new paradigm of teaching tools.

2. material and methods

Quantitatively, the study adopted a cross-sectional survey research design. Cross sectional survey is designed to collect pertinent and precise information concerning the current status of phenomena in a short amount of time (Creswell, 2012). A survey also aims to determine individual opinions about issues, which will help to identify their important beliefs and attitudes and evaluate the use of networking in selected colleges of education in Ghana. This design enabled the researcher to gather and interpret information for clarification (Orodho, 2003). Even though getting enough of the questionnaires to be completed and returned in good time for meaningful analysis to be made is one of the demerits of the survey design, the survey design is regarded as the most appropriate for arriving at the needed answers in this research.

**Study Site**

The research focused on the Colleges of Education in Ghana that run the Home Economics programmes. These Colleges are in the Ashanti, Western, Eastern, Central, Oti, Upper West, Volta, Greater Accra, Northern and Bono Regions. Tutors at Colleges of Education train teachers to teach in the first cycle institutions in Ghana. As a result, tutors in the Colleges of Education must use a wide range of teaching strategies to fully prepare teacher trainees to meet the task ahead of them.

The population of the study includes sixteen (16) public Colleges of Education in Ghana offering Food and Nutrition. The categories of respondents targeted in the Colleges were tutors and students offering Food and Nutrition. Tutors are in charge of setting standards and also training to ensure that students are well prepared in the areas of knowledge. Students are responsible for demonstrating content pedagogical skills in their career. The total target population was estimated at 859 respondents, comprising; 19 tutors, and 840 students offering Food and Nutrition. The target population details are shown in Table 1.

**Table 1: Distribution of tutors and students in the sixteen Colleges of Education**

|  |  |  |  |
| --- | --- | --- | --- |
| S/N | Name of College | No. Tutors | No. of students |
| 1. | St. Theresa’s College of Education | 1 | 43 |
| 2.  | Wiawso College of Education | 2 | 89 |
| 3. | St. John Bosco’s College of Education | 1 | 43 |
| 4. | Holy Child College of Education | 1 | 39 |
| 5. | St. Monica’s College of Education | 2 | 78 |
| 6. | OLA College of Education | 1 | 44 |
| 7. | Agogo College of Education | 1 | 54 |
| 8. | Akatsi College of Education | 1 | 41 |
| 9. | Komenda College of Education | 1 | 78 |
| 10. | Presbyterian College of Education | 1 | 42 |
| 11. | Nusrat Jahan Ahmadiyya College of Education | 1 | 36 |
| 12. | Presbyterian Women’s College of Education | 1 | 37 |
| 13. | St. Vincent College of Education | 2 | 35 |
| 14 | Bagabaga College of Education | 1 | 67 |
| 15.  | Ada College of Education | 1 | 68 |
| 16. | St. Louis College of Education | 1 | 46 |
|  Total | 19 | 840 |

*Source: researcher, 2024*

Stratified, simple random and census sampling techniques were used to select the colleges and participants for the study. A stratified sampling technique was used to select 14 out of the 16 public Colleges of Education in Ghana offering Food and Nutrition. The schools were grouped into strata A and B. Strata A represent the seven girls, and Strata B represent nine mixed Colleges of Education. It was important for each group to be included in the researcher's sample; no group was left out. After this, the researcher randomly selected the colleges using proportional allocation to ensure that six and eight schools from strata A and B were selected, respectively. The 14 schools sampled represented a population of 782 respondents, constituting 16 tutors and 766 students. The remaining two schools were used for the pilot study. The stratified random sampling technique was employed because it increases the likelihood of representativeness, especially if the sample is small (Fraenkel & Wallan, 2006). The stratified sampling method ensures that the key characteristics of individuals in the population are included in the sample.

Krejcie and Morgan (1970) developed a table to select the students. Based on this table, the sample size was determined to be 256 respondents (refer to Appendix A). Therefore, 256 Food and Nutrition students were randomly selected for the study, representing 33.4% of the population. The table shows the relationship between sample size and population, which helps identify and obtain the required sample size for a study. All 16 tutors from the 14 public Colleges of Education were used as tutor respondents since the population was too small. Table 2 gives details of the sample size determined in the College of Education.

**Table 2: Sample size determination**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| S/N | Colleges of Education  | Population  | Sample size  | Total  |
| Tutors | Students  | Tutors | Students  |
| 1. | St. Theresa’s College of Education | 1 | 43 | 1 | 14 | 15 |
| 2. | Wiawso College of Education | 2 | 89 | 2 | 30 | 32 |
| 3. | St. John Bosco’s College of Education | 1 | 43 | 1 | 14 | 15 |
| 4. | St. Monica’s College of Education | 2 | 78 | 2 | 26 | 28 |
| 5. | OLA College of Education | 1 | 44 | 1 | 15 | 16 |
| 6. | Agogo College of Education | 1 | 54 | 1 | 18 | 19 |
| 7. | Akatsi College of Education | 1 | 41 | 1 | 14 | 15 |
| 6. | Komenda College of Education | 1 | 78 | 1 | 26 | 27 |
| 9. | Presbyterian College of Education | 1 | 42 | 1 | 14 | 15 |
| 10. | Nusrat Jahan Ahmadiyya College of Education | 1 | 36 | 1 | 12 | 13 |
| 11. | Presbyterian Women’s College of Education | 1 | 37 | 1 | 12 | 13 |
| 12. | Bagabaga College of Education | 1 | 67 | 1 | 23 | 24 |
| 13. | Ada College of Education | 1 | 68 | 1 | 23 | 24 |
| 14. | St. Louis College of Education | 1 | 46 | 1 | 15 | 16 |
|  | Total | 16 | 766 | 16 | 256 | 272 |

*Source: researchers, 2024*

Simple random sampling was used to select the students. Simple random sampling gave every student an equal chance of being selected to be included in the final sample. The census technique was used to select the tutors of the selected education colleges. In census, every element of the study population is considered to participate. The key advantage of the census is that it gives a high degree of statistical confidence in the survey results. According to Creswell and Plano-Clark (2011), a census study occurs if the entire population is tiny or reasonable to include it (for other reasons). The main instrument for data collection was a questionnaire. In order to achieve the objective of the study, a questionnaire was developed to gather information from the tutors and students of Colleges of Education offering Food and Nutrition. Close-ended items were used in developing the questionnaires because they are easy for respondents to answer, and they are also easy for researchers to analyse data (Gay, 1996). The respondents were asked to indicate the level to which they agreed or disagreed with the statements, and that helped to determine ways tutors and students could sustain networking in food and nutrition at colleges of education in Ghana. The researcher also ensured face validity by assessing the instruments' relevance, reasonability, unambiguity and clarity (Oluwatayo, 2012). This study deployed the internal consistency method in determining the instrument reliability with Cronbach Alpha as the relevant coefficient to evaluate. The internal consistency of each factor was determined by examining each item's inter-correlation and computing Cronbach’s Alpha. Generally, reliability coefficients less than 0.60 are considered poor, those in the range of 0.70 are acceptable, and those above 0.80 are considered good (Sekaran, 2003). The data collected were processed and analysed using correlation analysis and regression analysis. *Correlation analysis.* According to the presumption of the proposed link between the use of networking on effective teaching and learning of Food and Nutrition, the test measuring the association of variables was Pearson's correlation. Regression analysis was used to analyse the relationship between a dependent variable (Networking) and an independent or predictor variable (Effective teaching and learning). *The* aid of Statistical Package for Social Sciences (SPSS) version 23.0. All statistical analyses were tested at a 5% level of significance.

3. results and discussion on the Influence of Networking on Effective Teaching of Food and Nutrition

 **3.1 results on Descriptive analysis** the **Influence of Networking on Effective Teaching of Food and Nutrition**

The main issue considered in this section is related to the effective teaching and learning of Food and Nutrition variables. Respondents were asked to indicate their level of agreement with statements (indicators) on effective teaching and learning of Food and Nutrition. The responses gathered with the aid of questionnaire administration are presented in Table 3.

**Table 3: Responses on Effective Teaching and Learning of Food and Nutrition**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Effective Teaching and Learning** | **CAT** | **Descriptive** | **Overall mean** | **Decision**  |
| **Mean** | **Std. Dev.** |
| **Promote Learning** |  |  |  |  |  |
| Foster self-paced learning | TU | 4.29 | 0.611 | 3.94 | Agreed |
| ST | 3.59 | 0.783 |
| Improve students’ interest and motivation for the course | TU | 4.57 | 0.938 | 4.10 | Agreed |
| ST | 3.63 | 1.115 |
| Promote better complex conceptual understanding. | TU | 4.64 | 1.082 | 4.03 | Agreed |
| ST | 3.41 | 1.007 |
| Help students attain the learning outcomes of the course | TU | 4.71 | 0.825 | 4.19 | Agreed |
| ST | 3.68 | 1.072 |
| Get rid of boredom | TU | 3.86 | 0.535 | 3.21 | Agreed |
| ST | 2.56 | 1.125 |
| ***Inspire Enthusiasm***  |  |  |  |  |  |
| Tutor encouraged questions during networking education | TU | 4.07 | 0.730 | 3.70 | Agreed |
| ST | 3.33 | 1.026 |
| Tutor supports critical thinking and independent learning | TU | 3.64 | 1.336 | 3.61 | Agreed |
| ST | 3.58 | 0.920 |
| The tutor explains and helps in solving the tutorial questions | TU | 4.71 | 0.469 | 4.09 | Agreed |
| ST | 3.47 | 0.961 |
| The tutor asks questions that tap into level thinking | TU | 4.14 | 0.770 | 3.83 | Agreed |
| ST | 3.52 | 1.015 |
| The tutor recognises students do not understand and reviews as needed | TU | 4.00 | 1.177 | 3.75 | Agreed |
| ST | 3.49 | 1.036 |
| ***Facilitate Proper organisation***  |  |  |  |  |  |
| The tutor explains clearly to the students. | TU | 4.79 | 0.426 | 4.08 | Agreed |
| ST | 3.36 | 1.044 |
| Tutor materials are well prepared and carefully explained | TU | 4.36 | 0.842 | 3.99 | Agreed |
| ST | 3.61 | 0.959 |
| Tutors are available for help during his/her Network Education | TU | 4.50 | 0.519 | 3.94 | Agreed |
| ST | 3.37 | 1.150 |
| Tutors start and end their lectures/tutorials on time | TU | 4.57 | 1.089 | 4.08 | Agreed |
| ST | 3.58 | 0.920 |
| ***Facilitate Group Interaction*** |  |  |  |  |  |
| Students are encouraged to share their ideas and knowledge with others | TU | 4.29 | 1.437 | 3.89 | Agreed |
| ST | 3.48 | 0.997 |
| Students are encouraged to work in groups | TU | 4.71 | 0.825 | 4.11 | Agreed |
| ST | 3.51 | 1.032 |
| Students are encouraged to participate in discussions | TU | 4.86 | 0.363 | 4.26 | Agreed |
| ST | 3.66 | 0.895 |
| ***Achieved Breadth of the syllabus*** |  |  |  |  |  |
| The tutor covered all the course syllabus in the time available | TU | 3.71 | 0.994 | 3.31 | Agreed |
| ST | 2.90 | 1.199 |
| The tutor discussed all the objectives and learning outcomes and what was expected from the students  | TU | 4.71 | 0.825 | 4.14 | Agreed |
| ST | 3.56 | 0.991 |
| The tutor adequately discussed current developments in the field | TU | 4.36 | 1.082 | 3.92 | Agreed |
| ST | 3.48 | 1.082 |

Key: TU= Tutor; ST = Students; *CAT=Categories of respondents; Mean<3.0=Disagreed; >3.0=Agreed*

Note: MTU=mean for tutors, MST=mean for students

**Source**: researchers, 2024

***Foster Learning***

The finding from Table 4 indicated that the tutors and students had the same opinions on “promoting learning” as the effectiveness of teaching and learning Food and Nutrition. The respondents agreed that networking could foster self-paced learning (MTU=4.29, MST=3.59), improve student’s interest and motivation for the course (MTU=4.57, MST=3.63), promote better complex conceptual understanding (MTU=4.64, MST=3.41), and help students attain the learning outcomes of the course (MTU=4.71, MST=3.68). On the other hand, only the tutors agreed that networking could get rid of boredom (MTU=3.86), whereas the students disagreed that networking could get rid of boredom (MST=2.56).

The overall mean showed that networking could foster self-paced learning, improve students' interest and motivation in the course, promote better complex conceptual understanding, help students attain the course's learning outcomes, and eliminate boredom in the teaching and learning processes. All these statements met a predetermined cut-off point of 3.0, so effective learning of Food and Nutrition is promoted.

***Inspire Enthusiasm***

As displayed in Table 4, the tutors and students had the same view on all the items under inspire enthusiasm as effective teaching and learning of Food and Nutrition. The respondents agreed that the tutor encouraged questions during networking education (MTU=4.07, MST=3.33), supported critical thinking and independent learning (MTU=3.64, MST=3.58), explained and helped in solving the tutorial questions (MTU=4.14, MST=3.52), and recognises students do not understand and review as needed (MTU=4.00, MST=3.49). The overall mean showed that networking could ensure effective teaching and learning by inspiring students' enthusiasm. The mean score of all the items met the predetermined cut-off point of 3.0. Hence, tutors motivate students to learn Food and Nutrition.

***Proper organisation***

As depicted in Table 4, the tutors and students had the same views on the items stated under proper organisation as effective teaching and learning of Food and Nutrition. The respondents agreed clearly with the students (MTU=4.79, MST=3.36), and the materials were well prepared and carefully explained (MTU=4.36, MST=3.61). Moreover, the respondents agreed that tutors are available for help during their network education (MTU=4.50, MST=3.37) and that their lectures/tutorials are on time (MTU=4.57, MST=3.58). The mean score of all the items under the proper organisation of lectures met the predetermined mean score of 3.0. Therefore, there is effective teaching and learning of Food and Nutrition through proper organisation of lectures.

***Group Interaction***

From Table 4, the tutors and students had similar views on all the items under group interaction as an effective way of teaching and learning Food and Nutrition. The respondents indicated that students are encouraged to share their ideas and knowledge with others (MTU=4.29, MST=3.48), students are encouraged to work in groups (MTU=4.71, MST=3.51), and students are encouraged to participate in discussions (MTU=4.86, MST=3.66). The mean score of all the items stated under group interaction met the predetermined cut-off point of 3.0. Hence, proper group interaction between tutors and students is guaranteed, ensuring effective teaching and learning of Food and Nutrition at the Colleges of Education in Ghana.

***Achieved Breadth of the syllabus***

The data indicated that the tutors and students agreed on two items under joint initiative. The respondents agreed that the objectives, learning outcomes, and expectations from students are discussed (MTU=4.71, MST=3.56), and current developments in the field are adequately discussed (MTU=4.36, MST=3.48). On the other hand, the tutors agreed they covered all the course syllabus in the time available (MTU=3.71), whereas the students disagreed with that effect (MST=2.90). However, the mean score of all the items under the bread of the syllabus met the predetermined mean score of 3.0. Hence, for effective teaching and learning, the breadth of the Food and Nutrition syllabus is always achieved

***Summary of effective teaching and learning of Food and Nutrition***

The effectiveness of teaching and learning Food and Nutrition was measured using a scale of 1 to 5, where 1 = strongly disagree to 5 = strongly agree. Items for each effective teaching regarding Food and Nutrition were combined and averaged to provide one composite score for each.

**Table 4: Summary of the items’ Statistics**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| S/N | Effective teaching and learning | No. of items | Mean | Std. deviation |
| 1. | Promote learning | 5 | 3.06 | 0.91 |
| 2. | Inspire enthusiasm | 5 | 3.79 | 0.94 |
| 3. | Proper organisation | 4 | 4.02 | 0.87 |
| 4. | Group interaction | 3 | 4.09 | 0.92 |
| 5. | Achieve breadth of syllabus | 3 | 3.79 | 1.03 |
|  | Average  | 20 | 3.75 | 0.94 |

*Source: researchers, 2024*

As presented in Table 4, promoting learning as effective teaching and learning of Food and Nutrition had a mean score of 3.06 and a standard deviation of 0.91. Again, practical teaching and learning of Food and Nutrition regarding inspiring enthusiasm had a mean score of 3.79 and a standard deviation of 0.94. On the other hand, the effectiveness of teaching and learning regarding proper organisation had a mean score of 4.02 and a standard deviation of 0.87. In addition, group interaction as effective teaching and learning had a mean score of 4.09 and a standard deviation of 0.92. Also, achieving breadth of syllabus had a mean of 3.79 and a standard deviation of 1.03. The overall mean of 3.75 and a standard deviation of 0.94 indicates effective teaching and learning of Food and Nutrition at the Colleges of Education in Ghana.

* 1. **Discussion of Results on the Influence of Networking on Effective Teaching of Food and Nutrition**

From the analysis of the results, it is clear that networking had a positive and significant effect on effective teaching and learning of food and nutrition. It was discovered that networking in Food and Nutrition promotes learning, inspires enthusiasm, ensures proper organisation and group interaction, and helps achieve breadth of syllabus. The finding agrees with the study by Babb (2019) that network education has a significant positive impact on student test scores, as well as the ability to reverse the trend of decreasing student attitudes towards science, which holds great promise for getting more stakeholders to support the cause for more practical student learning.

The result supported the study by Sloep and Berlanga (2011) that networks contribute to both the quality of the teaching profession and students' learning experience by encouraging collaboration and knowledge exchange at both the teacher and student levels. What makes networking successful at creating change is its ability to generate enough excitement, relevance, and value to attract and engage members and encourage members to act on what they learn from the group. The value of networking may not be immediately apparent during its initial stages. The value probably resides in sharing problems and needs in the short term. On the same issue, Wenger *et al.* (2002) revealed that networking education influences quality teaching. Networking builds a systematic body of knowledge that can be easily accessed. The value is in the social interactions between the group members.

According to Nee (2014), educational networking ensures effective teaching and learning. Nee indicated that educational networks foster self-paced learning, eliminate boredom, promote better complex conceptual understanding, improve students’ interest and motivation, expose students to extra information, and enhance communication and interactivity. The results indicated that students instructed by the instruction with intervention performed more significant gain scores of all three cognitive levels than those instructed by the conventional approaches. Educational networks permeate all facets of the curriculum as a new paradigm of teaching tools.

4. Conclusion

It became evident from the study that networking influences effective teaching and learning of Food and Nutrition at Colleges of Education in Ghana. Networking in Food and Nutrition education promotes learning, inspires enthusiasm, ensures proper organisation and group interaction, and helps achieve breadth of syllabus. It can expediently conclude that sharing what is learnt, sharing what is created, encouraging positive contributions from each other, maintaining contacts with students in the team, and consistently utilising networking in the teaching-learning process can help sustain networking in Food and Nutrition Education in Colleges of Education in Ghana since the study found that networking influences effective teaching and learning, the government and various stakeholders must develop a formal policy for adopting and using networking in Food and Nutrition Education.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that no generative AI technologies such as large language models (ChatGPT, copilot, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

COMPETING INTERESTS

The authors have declared that no competing interests exist.

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