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DESIGN AND DEVELOPMENT OF A CRITICAL THINKING PEDAGOGY FOR STUDENTS OF ABIA STATE COLLEGE OF EDUCATION (TECHNICAL), AROCHUKWU.

[1] JOSEPH IZUCHUKWU KANU,[2] A.K. JIBRIL, [3]OKWUDIRI NWAORGU & [4]EZE, VICTOR UMACHI

1. Department of Educational Foundation, Abia State College of Education (Technical) Arochukwu
2. Department of Electrical/Electronic Technology, Abia State College of Education (Technical) Arochukwu
3. Department of Accounting Education, Abia State College of Education (Technical) Arochukwu
4. Department of Political Science, Abia State College of Education (Technical) Arochukwu

Abstract

Many students entering tertiary education institutions such as Universities, Polytechnics and Colleges of Education in Nigeria lack critical thinking skills which are essential for problem solving capability, mastering of their studies in classrooms and laboratories as well as their future work places. Hence, this paper proposed a critical thinking pedagogy for students of Abia State College of Education (Technical) Arochukwu. To achieve this objective, the authors reviewed studies and models for the development of critical thinking skills. Based on the reviewed studies, the authors developed an improved critical thinking pedagogy for students of Abia State College of Education (Technical) Arochukwu. Another study is therefore needed to test the efficacy of the developed model.

Keywords: Pedagogy, skills, critical thinking, critical thinking skills, critical thinking model.

1. Introduction

Today's workplace is characterized by innovation, competiveness, complexity and uncertainty. To prepare students to fit into this type of workplace after graduation requires them to be equipped with critical thinking skills among others. Profetto-McGrath (2003) defined critical thinking as "an active, ongoing cognitive process of logical reasoning in which the individual methodically explores and analyzes issues, interprets complex ideas, considers all aspects of a situation and/ or argument and where appropriate, follows with prudent judgment". Critical thinking is a mental process where individuals need to actively and skilfully conceptualize, apply, analyze, synthesize, and evaluate information to reach an answer or conclusion (Changwong, Sukkamart & Sisan, 2018). Heard ,Scoular, Duckworth, Ramalingam and Teo (2020) maintained that the term 'critical thinking' is reserved by some, particularly from the philosophical tradition, to refer to a form of reflective thinking directed towards the analysis and evaluation of existing communication, information and arguments, particularly through the use of logic and reasoning. In specific, critical thinking is a cognitive skill that plays a crucial role in logical thinking, decision-making and problems solution (Heer, 2012; Fisher, 2001). Critical thinking helps students to reason logically about class academic challenges and then takes appropriate decisions to overcome them. In other words, there is relationship between student's critical thinking ability and academic achievement. Evidently, Stupinsky, Renaud, Daniels, Haynes, and Perry (2008) conducted research on critical thinking dispositions and perceived academic control and achievement of pre-service teachers. Their findings revealed that college students who had high academic achievement were strongly committed to think critically. In recognition of the importance of critical thinking as one of the factors that improve student's academic achievement in school as well as in their future endeavours that it become one of the objective of the contemporary curricula (Živkovic, 2016). Critical thinking process may improve their problem-solving abilities while also encouraging creativity or curiosity (Sharma, Doshi, Verma &,Verma, 2022).

Effective critical thinking requires critical thinking skills. Critical thinking skills include analysis, evaluation, inference, deductive and inductive reasoning (Stewart & Dempsey, 2005). Chavan and, Khandagale(2014) asserted that the list of core critical thinking skills includes observation, interpretation, analysis, inference, evaluation, explanation, and meta-cognition. Critical thinking, as opposed to rote

memorization, involves active and skilful demonstration of higher-order thinking skills (analysis, synthesis, and evaluation) among learners. Critical thinking skills are teachable and learnable skills and therefore schools can develop teaching and learning activities geared towards developing student's critical thinking. There are a variety of methods of teaching and learning concerning critical thinking skills. Cognitive approach is one of the most effective ways of developing student's critical thinking. In cognitive approach, students learn to apply cognitive skills such as hypothesizing, designing, performing, and analyzing a series of investigations (Vong & Kaewurai, 2017). Cognitive approach is based on some theories. Such theories according to Vong and Kaewurai (2017) include constructivist learning theory, cognitive development theory, social-cognitive theory, cognitive information processing theory, and adult learning theory in which the key principles form the basic root in fostering learners to use critical thinking in order to construct new knowledge themselves. Constructivist learning theory is extensively related to students constructing new knowledge based on their past experiences (Bruner, 1960), cognitive development theory focuses on learning constructed through stages of development (Dewey, 1916; Piaget, 1963), social-cognitive theory is learning that occurs through social interaction (Meichenbaum, 1977), cognitive information-processing theory is concerned with students learning through analyzing the information (Broadbent, 1958), and adult learning theory is related to individual needs and freedom (Knowles, 1984).

Cognitive thinking skills are embedded into the curriculum of schools and are taught and learned using a variety of teaching and learning strategies. Gupta (2005) observed that teaching and evaluation of critical thinking in the current collegiate environment and curricula are insufficient. As result, researchers have developed a number of critical thinking teaching and learning models with the aim of improving student's critical thinking skills. For example, Vong and Kaewurai (2017) developed an instructional model to enhance critical thinking and the critical thinking teaching ability of trainee students at the Regional Teacher Training Center (RTTC) in Takeo province, Cambodia. Changwong, Sukkamart and Sisan(2018) reported that nine experts developed a 5-step critical thinking learning management model and its evaluation study indicated that students taught with the model outperformed those students taught with the traditional model in terms of critical thinking and academic achievement respectively. Susandi, Sa'dijah, As'ari & Susiswo (2022) developed learning model M6 designed to improve students' critical thinking skills.

Critical thinking is assessed using variety of instruments and methods. Such methods and instruments according to LaMartina and Ward-Smith (2014) include the California Critical Thinking Skills Test (CCTST) and the California Critical Thinking Disposition Inventory (CCTDI), as well as the Watson-Glaser Critical Thinking Appraisal (WGCTA). The CCTST consists of 34 multiple-choice items which are capable of assessing the critical thinking skills. Subscales within the CCTST are analysis, inference, and evaluation. The CCTDI is a 75 Likert-repose instrument which uses seven subscales to identify one's disposition towards critical thinking. The WGCTA uses responses to an 80 item survey to measure the reasoning skills associated with critical thinking.

Although the above developed critical thinking models are logical, effective and efficient but they need to be modified in order to be more effective in Nigerian educational context. Thus, this paper proposed a critical thinking pedagogy for the development of students' critical thinking skills in Abia State College of Education (Technical) Arochukwu. The model is built based on the reviewed models and at the same time captured some peculiarities in Nigerian educational system. The rest of the paper is ordered as follows. Section 2 presented the problem that give raise to the study. Section 3 presented objectives and research questions for the study. Section 4 is the literature review which discussed the concept of critical thinking and critical thinking skills. Section 5 presented strategies for teaching critical thinking skills. Sections 6 discussed critical thinking teaching and learning models while section 7 presented motivation in critical thinking skills. Section 8 on the other hand presented the developed model. Sections 9 presented conclusion and recommendation.

2. Statement of the Problem

The predominant method of teaching in Nigerian secondary schools is teacher-centered one, which, of course does not encourage critical thinking. As result, students entering tertiary education institutions such as University, Polytechnics and Colleges of education lack critical thinking skills which usually developed through student's centered teaching method. Critical thinking skills help students to master their studies in

classrooms, laboratories as well as workshops. This lack of critical thinking skills on the part of students is partly the cause of poor performance of students in examinations. Some of the existing models that help to develop students' critical thinking skills do not take into consideration of learners characteristics such as resistance to critical thinking and mechanisms to take care of it in their models. This paper therefore developed a critical thinking pedagogy to that is student centered and took into consideration of students' characteristics.

3. Objective of the Study

The objective of this study was to develop critical thinking skill pedagogy for students of Abia State College of Education (Technical) Arochukwu.

4. Literature Review

The literature review was conducted under the following headings: concepts of critical thinking and critical thinking skills, strategies for teaching critical thinking and critical thinking teaching and learning models.

Concept of Critical Thinking

Critical thinking is one of the higher order thinking skills where people use in decision making. Dwyer (undated) defined critical thinking as a metacognitive process, consisting of a number of skills and dispositions that through purposeful, self-regulatory reflective judgment, increases the chances of producing a logical solution to a problem or a valid conclusion to an argument. According to Dewey, Hickman and Alexander (1998) critical thinking can also be associated with the scientific method (used in science orientated subjects), where a problem is identified, an hypothesis formulated, relevant data collected, analysed and evaluated and conclusions were drawn from the outcome, thus scientific thinking. Students can use critical thinking skills to master their studies (de Jager, 2019). Critical thinking is very important to people of all works of life. It is useful for students in classroom and workers in workplace. In fact, it is useful in day-to day activities. Boris (2022) presented the following as some of the benefits of critical thinking:

- Greater reflective thinking and self-awareness;
- Ability to audit new information;
- Better interpersonal relationships;
- More creative thinking and problem-solving skills;
- Expanded open-mindedness;
- Improved communication and presentation skills;
- Freedom from past experiences and attachments.

Heard ,Scoular, Duckworth, Ramalingam and Teo (2020) stated that in an attempt to develop a clear, universally acceptable, interdisciplinary definition of critical thinking, the 1988–1990 American Philosophical Association's (APA) Delphi Project, led by Peter Facione (1990), engaged a panel of 46 experts from a range of disciplines in the humanities, sciences, social sciences, and education. The project was live for two years and the resulting definition determined that critical thinking involves:

purposeful, self-regulatory judgement which results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential, conceptual, methodological, criteriological, or conceptual considerations upon which that judgement is based (Facione, 1990, p. 3).

The resulting APA framework of critical thinking defines six core skills: interpretation, analysis, inference, evaluation, explanation and self-regulation. Each core skill is supported by a set of subskills, which are presented in Table 1.

Table 1: Core critical thinking skills

Skill	Experts' consensus description	Subskills
Interpretation	Comprehend and express the meaning or significance of a wide variety of experiences, situations, data, events, judgements, conventions, beliefs, rules, procedures or criteria.	• Categorisation • Decode significance • Clarify meaning
Analysis	Identify the intended and actual inferential relationships among statements, questions, concepts, descriptions or other forms of representation intended to express beliefs, judgements, experiences, reasons, information, or opinions.	• Examine ideas • Identify arguments • Identify reasons and claims
Evaluation	Assess the credibility of statements or other representations that are accounts or descriptions of a person's perception, experience, situation, judgement, belief, or opinion; and to assess the logical strength of the actual or intended inferential relationships among statements, descriptions, questions or other forms of representation.	• Query evidence • Conjecture alternatives • Draw logically valid or justified conclusions
Inference	Identify and secure elements needed to draw reasonable conclusions; to form conjectures and hypotheses; to consider relevant information and to reduce the consequences flowing from data, statements, principles, evidence, judgements, beliefs, opinions, concepts, descriptions, questions, or other forms of representation.	• Assess credibility of claims • Assess quality of arguments using inductive and deductive reasoning
Explanation	To state the results of one's reasoning; to justify that reasoning in terms of the evidential, conceptual, methodological, criteriological and contextual considerations upon which one's results were based; and to present one's reasoning in the form of cogent arguments.	• State results • Justify procedures • Present arguments
Self-regulation	Self-consciously to monitor one's cognitive activities, the elements used in those activities, and the results educed, particularly by applying skills in analysis and evaluation to one's own inferential judgements with a view toward questioning, confirming, validating, or correcting either one's reasoning or one's results.	• Self-monitor • Self-correct

Adapted from Facione (1990).

University of Leeds in Changwong, Sukkamart and Sisan(2018) outlines the key steps in thinking critically which include:

1. ***Describing*** – by clearly defining what you are talking about, what specifically was involved, where it took place and under what circumstances;

2. ***Reflecting*** – reconsidering a topic by taking into account new information or a new experience, or considering other viewpoints;

3. ***Analyzing*** – examining and then explaining how something is, including comparing and contrasting different elements and understanding relationships to your subject/ topic;

. 4. ***Critiquing*** – identifying and examining weaknesses in arguments, as well as acknowledging its strengths. It's important to think of critiquing as 'neutral' and not negative;

5. Reasoning – using methods such as cause and effect to demonstrate logical thinking, as well as presenting evidence that either refutes or proves an argument;

6. Evaluating – can include commenting on the degrees of success and failure of something, or the value of something.

5. Strategies for Teaching Critical Thinking

Abrami, Bernard, Borokhovski, Wade, Surkes , Tamim and (2008) categorized instructional strategies for critical thinking into four ways: (a) a mixed approach, in which critical thinking was taught as a separate unit within a course of other content; (b) an immersion approach, in which critical thinking was a by-product of instruction; (c) a general approach, in which critical thinking was taught as the explicit course outcome; and (d) an infusion approach, in which critical thinking skills were embedded into the course content and explicitly stated as an outcome. Emerson (2013) described these approaches as follows. For example, in an introductory instructional design course, a mixed approach would involve a separate unit on critical thinking skills, isolated from the subject-matter of instructional design. In that same instructional design course, an immersion approach would involve a discussion on a contentious topic, such as instructivism versus constructivism (see Sweller, Kirschner, & Clark, 2007, for complete discussion), and the act of digging deeper for assumptions and analyzing the topic from multiple perspectives would simply occur as the topic was being explored. An example of a general approach would be a completely separate course on critical thinking skills. Finally, an infusion approach in an instructional design course would involve the explicit instruction of critical thinking skills being directly applied to the subject-matter of instructional design (i.e., "This is how to distinguish causation from correlation when evaluating whether the instructional strategy caused the outcome, or was merely correlated with the outcome.

6. Critical Thinking Teaching and Learning Models

In an effort to develop or improve student's critical thinking abilities, a number of researchers have come-up with a number of critical thinking teaching and learning models. This sub-section discussed some of them in relation to development or improvement of students' critical thinking ability and academic achievement.

RED Model

The RED model is a simple and practical critical thinking model that stands for Recognize Assumptions, Evaluate Arguments, and Draw Conclusions. The model is depicted in figure 1. An assumption is something that is believed to be true even without evidence. In developing critical thinking skills, the ability to recognize assumptions are therefore required (Wulandari, Baedhowi & Hindrayani, 2020).

Figure 1: RED Model Source: Adapted from Pearson. (2017).

RED model helps one to identify the underlying beliefs and assumptions that influence his or her thinking, to assess the quality and relevance of the evidence and reasoning that support his or her arguments, and to reach logical and coherent conclusions based on the available information. RED model therefore, help

in development of critical thinking skills. The RED model can help one to avoid bias, confusion, and errors in your thinking, and to communicate ones' ideas more clearly and persuasively (LinkedIn, 2024).

Facione's Model

The Facione model is a comprehensive and holistic critical thinking model that identifies six core cognitive skills that are essential for critical thinking. They are Interpretation, Analysis, Evaluation, Inference, Explanation, and Self-Regulation. Each skill involves different mental abilities and processes that enable one to understand, examine, judge, infer, explain, and monitor your own thinking. The Facione model can help one to develop a well-rounded and flexible approach to critical thinking, and to apply it to various domains and contexts (LinkedIn, 2024).

PAUL-ELDER Model

The Paul-Elder model is a philosophical and ethical critical thinking model that focuses on the elements and standards of thought. It proposes that every thought can be analyzed according to eight elements: Purpose, Question, Information, Inference, Concept, Assumption, Implication, and Point of View. It also suggests that every thought can be evaluated according to nine standards: Clarity, Accuracy, Precision, Relevance, Depth, Breadth, Logic, Significance, and Fairness. The Paul-Elder model can help one to think more deeply and critically about his or her own and other's thinking, and to improve the quality and integrity of thought (LinkedIn, 2024).

7. Motivation and Critical Thinking

Motivation is a very important factor in teaching and learning endeavour. It increases learner's effort to achieve a certain educational goal or objective. Widyawati, Suyanta, Kuswanto, Suyanto and Zhanbyrbaevna (2024) stated that motivation to learn can stem from intrinsic factors like the desire to succeed, as well as external factors such as the need for recognition, a supportive environment, and engaging and enjoyable activities. Furthermore, it is often observed that students who underperform are not lacking in ability, but rather lack the motivation to learn, leading them to not fully utilize their abilities. Therefore, motivation in developing learner's critical thinking skills is very crucial.

There are a number of learning motivation theories that can help teachers in designing and developing instructional materials for developing learners' critical thinking skills. One of such learning motivation theories is Uno's theory, which categorizes learning motivation into two groups: intrinsic and extrinsic motivation. According to Widyawati, Suyanta, Kuswanto, Suyanto and Zhanbyrbaevna (2024),Uno (2017) states that intrinsic motivation is characterized by (a) a desire and drive to succeed, (b) encouragement and needs in learning, and (c) future hopes and ideals. On the other hand, extrinsic motivation is characterized by (d) rewards in learning, (e) interesting desires in learning, and (f) a conducive learning environment. This theory is incorporated into the proposed model

8. The Proposed Model

Literature has shown that critical thinking skills are important not only in classroom pedagogical activities but also in daily activities. Literature also shows that critical skills are teachable skills. Last section presented a number of models and a theory that help to develop or improve students' critical thinking skills. But before delving directly into the design and construction of the model for the present study, we need to first consider the psychology of the learners to which the model meant for in order to factor it into the model.

Learning Motivation Theories

Emerson (2013) stated that a survey of the research literature has suggested that learners often resist critical thinking because it is a difficult process, learners are not confident they can perform the process, and the benefits of the extra required effort are not always perceived. Therefore, motivation mechanism must be put in place to overcome this resistance in the model. In this context, application of suitable motivation theories becomes helpful. Keller's (1987b) ARCS (Attention, Relevance, Confidence, and Satisfaction) design model of instructional motivation is a very effective instructional motivation model in this regard. In addition, Uno's (2017) motivation theory which states that intrinsic motivation is characterized by (a) a desire and drive to succeed, (b) encouragement and needs in learning, and (c) future hopes and ideals. On

the other hand, extrinsic motivation is characterized by (d) rewards in learning, (e) interesting desires in learning, and (f) a conducive learning environment is also relevant in this context. This theory is incorporated into the proposed model. Cox (2014) identified some strategies that promote development of critical thinking skills. Such strategies includes encourage students to question everything, activate student curiosity, incorporate project-based learning, offer diverse perspectives and promote collaboration. In all, motivating learners play a key role in developing learners' critical thinking skills.

Critical Thinking Skills

For a learner to think critically that will in turn results to mastering of subject or course, he or she to a large extent must possess critical thinking skills. Many critical thinking development models outlined such skills. This study, focused on the critical thinking skills presented in RED and Facione's models. Table 2 presents the critical thinking skills for the model while figure 2 depicts pictorial view of the model

Skill	**Sub-skill**
Recognize Assumption	• Identify assumption • Classify assumption into fact and opinion
Analyze Issues	• Break down issues/ideas/arguments or concepts into small parts • Examine issues/ideas/arguments or concepts • Put issues/ideas/argument or concept into proper context
Evaluate Issues	• Compare two or more view points/terms/issues or arguments with fact or standard • Take decision based on the comparison
Infer	• Draw conclusion based on the what is evaluated • Make prediction based on what is evaluated
Communicate Outcome	• State results • Justify procedure followed • Present argument in logical order
Self-regulation	• Reflection during thinking • Self examination during • Pose during thinking • Question self during thinking • Self correction during thinking

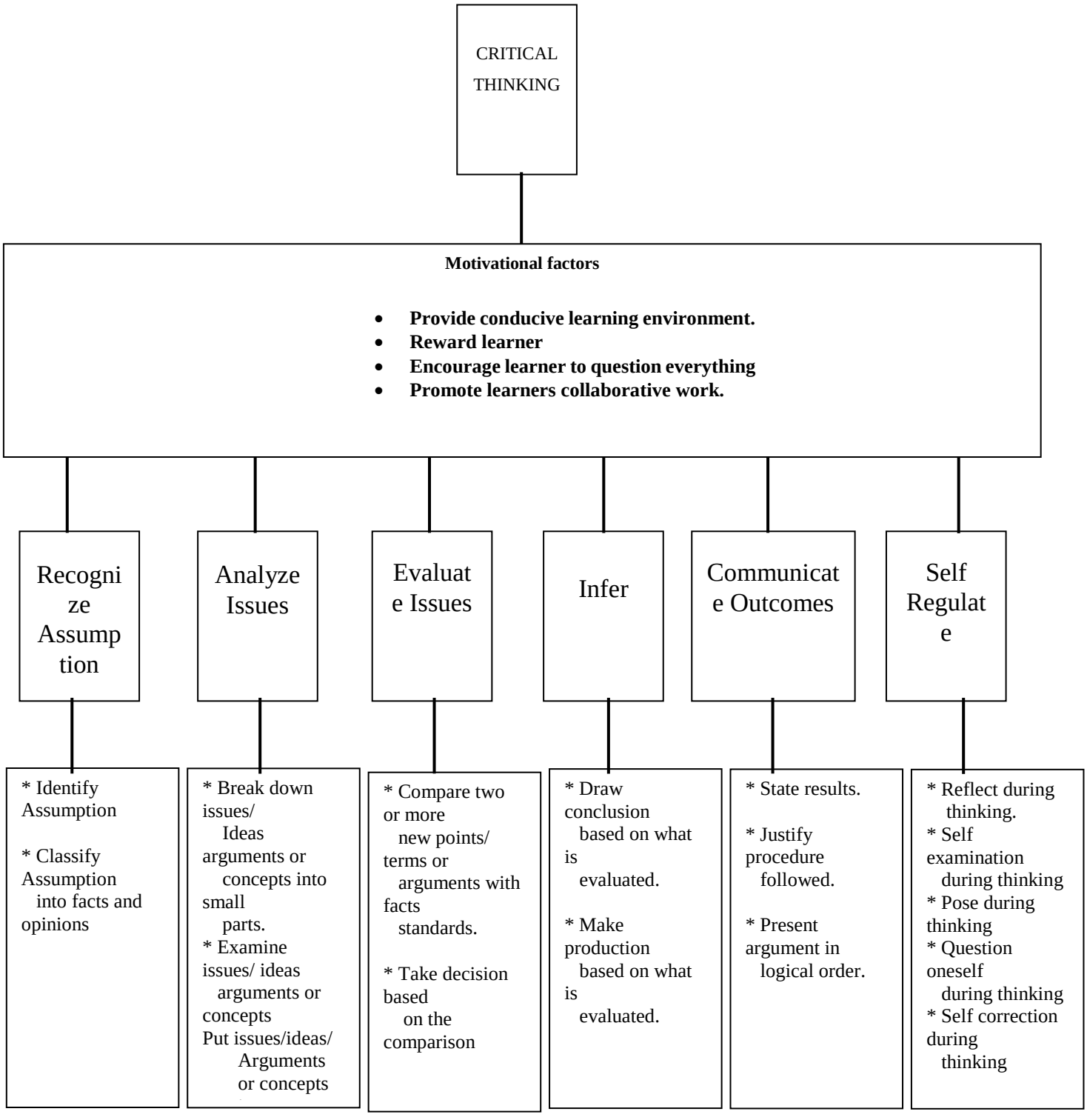
CRITICAL THINKING
Motivational factors
Provide conducive learning environment.
Reward learner
Encourage learner to question everything
Promote learners collaborative work.
Recognize Assumption
Analyze Issues
Evaluate Issues
Infer
Communicate Outcomes
Self Regulate
* Identify Assumption
* Classify Assumption into facts and opinions
* Break down issues/ Ideas arguments or concepts into small parts.
* Examine issues/ ideas arguments or concepts
Put issues/ideas/ Arguments or concepts
* Compare two or more new points/ terms or arguments with facts standards.
* Take decision based on the comparison
* Draw conclusion based on what is evaluated.
* Make production based on what is evaluated.
* State results.
* Justify procedure followed.
* Present argument in logical order.
* Reflect during thinking.
* Self examination during thinking
* Pose during thinking
* Question oneself during thinking
* Self correction during thinking

Figure 2: Proposed Model of Critical Thinking Pedagogy

9. Conclusion and Recommendation

Critical thinking skills are part and parcel of the curriculum of both secondary schools and as well as tertiary education institutions. Critical thinking skills help students to make sound decisions after information gathering, analysis and evaluation in school contexts. Critical thinking skills also help students in their future workplaces as well as in their day-to-day activities. However, despite the appearance of the critical thinking and critical thinking skills in the curriculum, most students entering tertiary educational institutions such as Universities, Polytechnics and Colleges of Education lack critical thinking skills. In an effort to improve students critical thinking skills, the authors of this paper reviewed literature on the existing models for development of critical thinking skills and thereafter came up with a model that is suitable to Nigerian educational context. In specific, the model is simply a synthesis of RED and Facione's models in conjunction with Uno's motivation theory . The authors recommend the use of the model in the College to test its efficacy.

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