

Reinforcing the 21st Century Pedagogical Skills through the Application of the Question Formulation Technique (QFT) in Secondary Schools in South Eastern Region of Kenya

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ABSTRACT

Studies show that only 27% of graduates believe that Universities and colleges taught them how to ask their own questions. The Question Formulation Technique (QFT) imparts students a way that makes them to think critically every time they read, connect the concepts and when deciding whether to take facts and information at face value or to dig a little deeper. Generally, it is reported that students ask less than a fifth of the questions teachers estimated would be elicited and deemed desirable. Poor participation by students in the questioning during teaching and learning process has often led to poor learning outcomes which are manifested by poor performance in academics. The study was instituted to evaluate the equipping of 21st skills to secondary schools' students using QFT trained teachers in ten schools in the South Eastern Region of Kenya. The teachers and students were trained to develop skills in producing of questions, categorizing questions, prioritizing questions and in reflections. The study found that teachers were eager to be trained in QFT skills so as to enhance an observed low student engagement and poor performance. The assessment of the implementation of QFT in content delivery found that students had many questions to ask if given opportunity and not judged during the teaching and learning process. The analysis of the questions showed that the QFT sparked student's potentials into divergent, convergent and metacognition types of thinking during and after the teaching and learning process. The teachers had a challenge of focusing the student class questions to achieve the lesson objectives in the stipulated time of the lesson. However, online engagement of students with teacher was observed to be a key in spurring more learners' curiosity in learning and in developing patterns in their thinking and ask questions and facilitate lifelong learning.

Keywords: Teaching; Learning; Engagement; Curiosity; Performance; Collaboration; Innovation

INTRODUCTION

Historical Background of Question Formulation Technique (QFT)

The Question Formulation Technique (QFT) originated in United States of America (USA) in a small Massachusetts village in the early 1980s. It was a programme which focused in preventing students' school

dropout rates. In this programme, social workers observed that parents were not engaged in the teaching and learning process for their children for they did not have knowledge on what questions to ask about their children's performance. To address this challenge, the social workers began to provide the parents with sample common questions to ask in the school meetings. These questions were quite general and could not address the unique circumstances of each parent and learner. This made the social workers to adjust and change their approach. They started to train the teachers through the process of identifying their issues and developing questions to address those concerned. As a result of this coaching, the teachers and even the social workers began to notice a remarkable change in the participation of the parents in the school programmes. Even parents who previously did not attend the school meetings started to attend the school meetings and attended with participation questions at hand. The success of the coaching of the parents and their eventual success of the students birthed the QFT.

Later, this question formulation coaching was transferred to learners. Previously the teachers used to be the question formulators who then asked the learners. Students eventually learnt to formulate their own questions for the teachers. The learners were taught how to formulate questions that were rational. Surprisingly, the teachers observed a remarkable improvement in learner engagement, learning and content retention. Students who had little interest in learning became more participatory and confident in the learning process. QFT increased their content retention and some learners said that it made them feel smart. The Question Formulation Technique (QFT) as a teaching strategy was first made widely available to the field of education in the book *Make Just One Change: Teach Students to Ask Their Own Questions* (Rothstein and Santana, 2015). Since the publication of the book, the strategy has been used in teaching and learning.

The Question Formulation Technique (QFT) as a Learning Strategy

Studies have shown that academic engagement decreases as learners move from middle school to high school (Fredricks et al., 2004). Furthermore, these learners were found to ask fewer questions as they get older (National Assessment of Educational Progress, 2011). Hence, there is a greater need for learners to be more engaged in the classroom and be able to take more ownership of the teaching and learning process. Several models have been proposed, but of late teachers globally are gradually integrating Question Formulation Technique (QFT) into their teaching and learning process. The QFT is based on the concept that the art of question formulation is a skill that is extremely important for learners in every subject but is not widely taught. Studies show that one of the key goals of a teacher is to stimulate the curiosity of learners in order to instill a desire to further explore and learn the subject matter outside of the classroom. Another important goal, often underemphasized, is to enhance the learners' ability to formulate questions relevant to particular topic.

The QFT has been found to be an excellent way of promoting student curiosity, creativity, critical thinking and teamwork. (LeBlanc et al., 2017). Research has it that the best teacher is the one who uses the highest number of questions during teaching. However, this kind of teacher cannot be better than a teacher who teaches in a way that prompts learners to ask the highest number of questions in a specific lesson. It is this kind of a teacher and a learner that this QFT proposal seeks to sustainably produce.

The Elements of the Question Formulation Technique

The QFT is comprised of four essential elements. The first element, involve the learners in Question Focus (Q Focus) element, which serves as a prompt to elicit questions. The learners formulate their own questions on the prompt with the following four rules for formulating questions: namely, (i). ask as many questions as you can. (ii). Do not stop to judge, discuss, or answer any questions. (iii). write down every question exactly as stated or exactly as it comes to mind. (iv). change any statements into questions. In the second element, learners begin to work with and improve their questions. They learn about two different types of

questions—closed-ended questions which can be answered with “yes”, “no”, or with one word; and open-ended questions which cannot be answered in such a manner, as they require more of an explanation. Learners then review their list of questions and label their questions as “C” if they are closed-ended, or “O” if they are open-ended. Next, learners name the advantages and disadvantages of both types of questions, reflect on how the wording of a question influences the type of information it may elicit, and then proceed to change one of their questions from closed-ended to open-ended and one of their questions from open-ended to closed-ended. In the third element of the QFT, learners begin to strategize on their use of questions. Depending on how questions will be used, the prioritization instructions may be tailored by the facilitator. For example, if the facilitator is hoping students will use their questions to guide research, the instructions may be “choose the three questions you are most interested in using to guide a research project.” After prioritizing, learners think on their rationale for why they prioritize certain questions keeping in mind the Q Focus, how many questions they asked in total, and where their priority questions landed in the sequence of all their questions. Learners are now ready to use these questions flexibly depending on the next steps of the learning process—whether it be for research purposes or otherwise. In the fourth and final element of the QFT, learners reflect on what they learned, how they learned it, and what they are thinking about differently after having gone through the process the previous elements are the core components of the QFT. With this said, the strategy is flexible and creates the space and opportunity for educators to tailor the strategy to better support the teaching and learning objectives.

Spurring Creative thinking and QFT

The QFT applies three modes of thinking to engage learners to formulate their own questions. That is the divergent thinking which means thinking in many different directions. This is applied along with the four cardinal rules to a question formulation exercise, centered on a concise and suitable question focus (Q Focus) created by the teacher. Then the convergent thinking- This means narrowing down on focusing which is applied to improve the clarity and direction of the learner generated questions, and to prioritize the more relevant questions. The teacher should devise an underlying purpose for the generated questions to be applied at this point. In this step variations are allowed so as to apply of the QFT. Lastly, the metacognition thinking, which is basically about just thinking. It can be optional. It is applied in order to reflect on the QFT process and improve on the learner’s awareness of the importance of question formulation process.

QFT imparts in students a way that makes them to think critically every time they read, connect the concepts and when deciding whether to take facts and information at face value or to dig a little deeper. QFT skill of asking questions is an essential yet often disregarded learning skill that not only allows people to think critically, feel greater power and self-efficacy but also make them confident. Studies show that only 27% of graduates believe that Universities and colleges taught them how to ask their own questions (Alison, 2016). Generally, it is reported that students ask less than 1/5th the questions teachers estimated would be elicited and deemed desirable (Sully, 1996; Harris, 2012). Poor participation by students in the questioning during teaching and learning process has often led to poor learning outcomes which are manifested by poor performance in academics. It is imperative that a strategy be found which motivates learners to ask questions and bring out a feeling of excitement for both teachers and learners. The QFT methodology ensures the attainment of quality of global education as envisioned in Sustainable Development Goal (No.4) which aims to promote quality education and lifelong learning. It is believed the QFT stands as a prime remedy in improving opportunities for all which stress on giving the right answer.

despite

QFT as a learning strategy has been in place for some time but its uptake in learning process has been poor. Notwithstanding QFT having been discovered a long time ago, many teachers have not customized it as a method of regular teaching. While the QFT has been widely used in other educational settings, its adoption in secondary schools in Kenya has not received prominence. It was therefore important that this pedagogical

practice be awakened due to the enormous value it adds to the teaching and learning process. This project therefore desired to elicit among the teachers and the learners the need to customize the strategy in the teaching and learning process.

THE METHODOLOGY

The Rotary International through the Kenya Connect in a venture involving Vocational Training Teams (VTTs) and the South Eastern Kenya University provided support to Kenyan school secondary teachers in teaching with technology and integration of 21st century skills in pedagogy. The venture was aimed at training teachers on integration of digital technology in their pedagogical practice in two phases. The three organizations engaged in the first phase of VTT (1) in four (4) selected clusters schools in South Eastern Region of Kenya. These were Kyaithani, Nyaani, Lower Yatta Girls and Kikaso secondary schools. Teachers were exposed to the methodology of incorporating the 21st Century skills in their pedagogical practices. Teachers from British Columbia (BC, Canada) assisted in training the teachers and providing insights of using technology in their pedagogy. The BC teachers mounted training workshops for the Kenyan teachers on this venture. The outcomes of these phase were quite encouraging and inspiring.

The success of the first phase gave impetus for the development of this second phase which involved the use of Question Formulation Technique (QFT) in teaching and learning process. It included 10 schools secondary namely, Nyaani, Mwaasua, Kikaso, Wakaela, St Lukes Girls Yatta, Musaani, Kyaithani, Miondoni, PCEA Ngugi and Kilembwa. It also involved 10 members of SEKU and 100 secondary school teachers who are teaching two subjects each (Table 1). This meant a total examination of 180 lessons. Each lesson had a preconference, a post conference preparation and a feedback session. Several teacher capacity development aspects on pedagogical skills in ICT, curiosity creation, thinking strategies in relation to the question formulation technique were be trained and evaluated.

Table 1. Target Schools and Population

S/n	Secondary School	Number of teachers
1	Nyaani Secondary School	12
2	Mwaasua Secondary School	10
3	Kikaso Secondary School	10
4	Wakaela Secondary School	12
5	St Lukes Girls Yatta Secondary School	6
6	Musaani Secondary School	1
7	Kilembwa Secondary School	14
8	St Pius Ngugi Secondary School	1
9	Kyaithani Secondary School	12
10	Miondoni Secondary School	11
TOTAL		100

QFT Assessment Methodology

The research relied on explanatory sequential mixed method design which included qualitative data from teacher, mentor and student surveys of classroom and content engagements. The QFT protocol assessment involved an evaluation on how the trained teacher prompted the students to ask questions. Then the learners were allowed to work in groups to come up with as many questions as possible from the prompt given by the teacher. The teachers were trained to have a QFT prompt that was concise, with a narrow scope and not

based on the teacher’s perspective of the concept or topic. The learners were given time to categorize, revise, and prioritize the questions which they came up with as was proposed in the book *Make Just One Change: Teach Students to Ask Their Own Questions* (Rothstein and Santana, 2015).

THE RESULTS

Evaluations of the QFT brainstorming class sessions

Observations showed that the level and intensity of student participation varied according to the school, depending on the subjects, depending on the topic and also seemed to vary according to the various teachers (Figure 1).

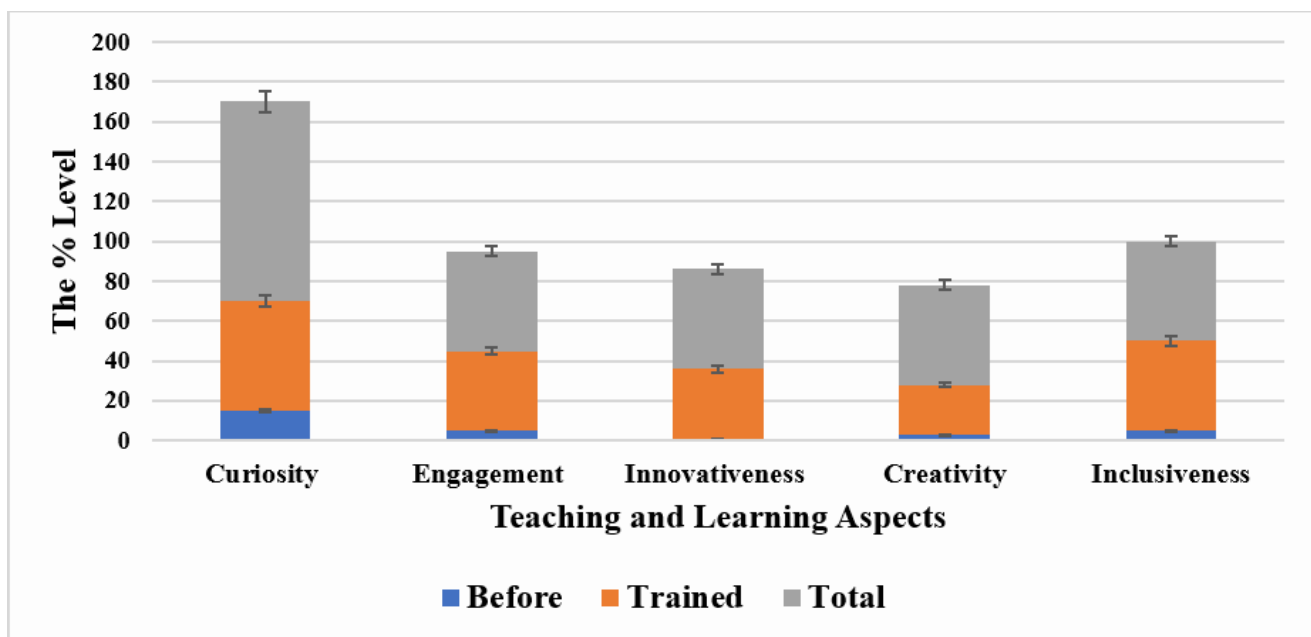


Figure 1. The average impact of QFT on secondary school students on levels of curiosity, engagement, innovativeness, creativity and inclusiveness in various school, subjects, topics and teachers in ten school in the South Eastern Kenya region.

The Curiosity level was related to the quality of Question Focus (Qfocus) developed by the teacher from the lesson objectives. In abstract subjects like Chemistry, the question focus was not easy to formulate except through careful assimilation of teaching aids in the lesson. This was because the topics were majorly unknown in the primary school level.

Generally, it was observed that during group brainstorming sessions a few learners seemed to dominate if not regulated by the teachers. The group leaders could make more questions to be elicited or could hinder the rest of the group from fully participating. Hence, there was need to carefully craft the groups so that discussions were open and free.

It was observed that if the teacher reviewed the lesson objectives carefully and combined them to form a comprehensive Question focus (Qfocus), the students produced more question and linked them to previous lesson.

Refining the Questions

After the questions are generated, the groups spend varied times to go through them and refine them as

necessary. This was also influenced by the teacher initial entry, the topic, the subject and the composition of the groups. (Figure 2). For example, a topic on ‘the role of leaf in photosynthesis’ in which the teacher has introduced nutrition in plants elicited more questions on; the color of the leaf, shape of a leaf, size of a leaf, patterns on the veins on the leaf, the place it was collected, when it was collected, the position of the leaf, why light is important, why water is important, who controls the process etc.

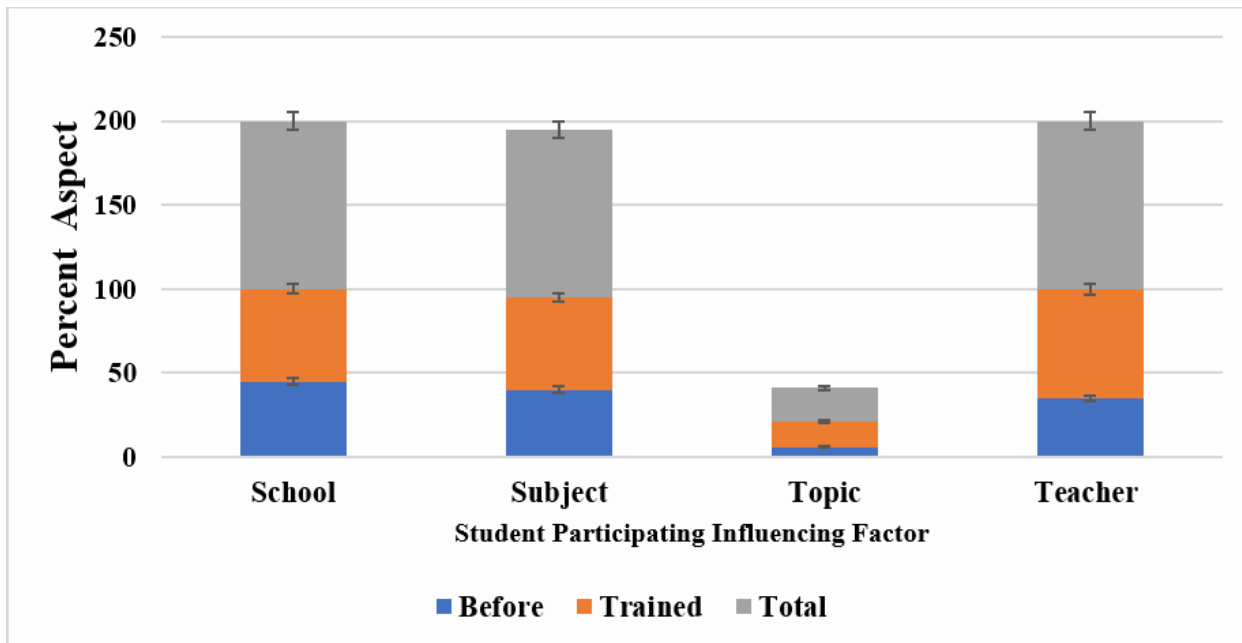


Figure 2. Analysis of the factors that seemed to influence student perception on question formulations session and prioritization session in Secondary schools during QFT assuagement. The training of the teacher and the choice of the topic factor were quite significant in spurring question formulation skills amongst learners.

In refining the questions to a maximum of five questions, it was observed that the students were eager to choose the questions that could be answered easily and with few words. Those that had a simple answer of ‘yes’ or ‘no’ were favored by many students. This tended to bring the majority of the discussions to an abrupt end of ‘so what’? Hence, teachers were encouraged to rephrase such question to as to keep the groups alive. This led to more higher thinking and even more questions.

The teachers who had not attended the trained sessions consistently were found to be jittery in allowing students to go freelance in pouring questions. They could be seen to be reverting back to the authoritarian position of a teacher. This made the students to tailor their questions in order to please their usual master. Hence, teachers needed to be retooled to allow as many questions as possible and have the skill of prioritizing the questions to achieve lesson objectives.

Summary of Observed Challenges

The study observed the following challenges, in almost 60% of the teacher, it was observed that the development of a suitable Qfocus or prompt to start the questioning process was a challenge. Teachers who found it easy were observed to be more experienced, had higher mastery of content but majority had spent more time in preparing the lesson and had familiar teaching aids for the learners.

The teachers who had not fully trained the students on the QFT approach of teaching and learning, encountered more initial challenges because the process may seem to be a lot of work in a lesson of 40

minutes. This is because the basis of question formulation was supposed to have been internalized. For example, the concept of One Husband and five Wives. This is in the asking of the basic questions on every issue. Including, the How? What? Where? When? Who? Why? The type of questions asked depended on the subject (Sciences, Humanities, Languages and Mathematics). There were more questions in subjects which were previously performed well in the school like in humanities compared to sciences. However, the QFT enhanced more questions in other subjects including Mathematics which was generally a low perfumed subject in secondary schools in Kenya (Figure 3),

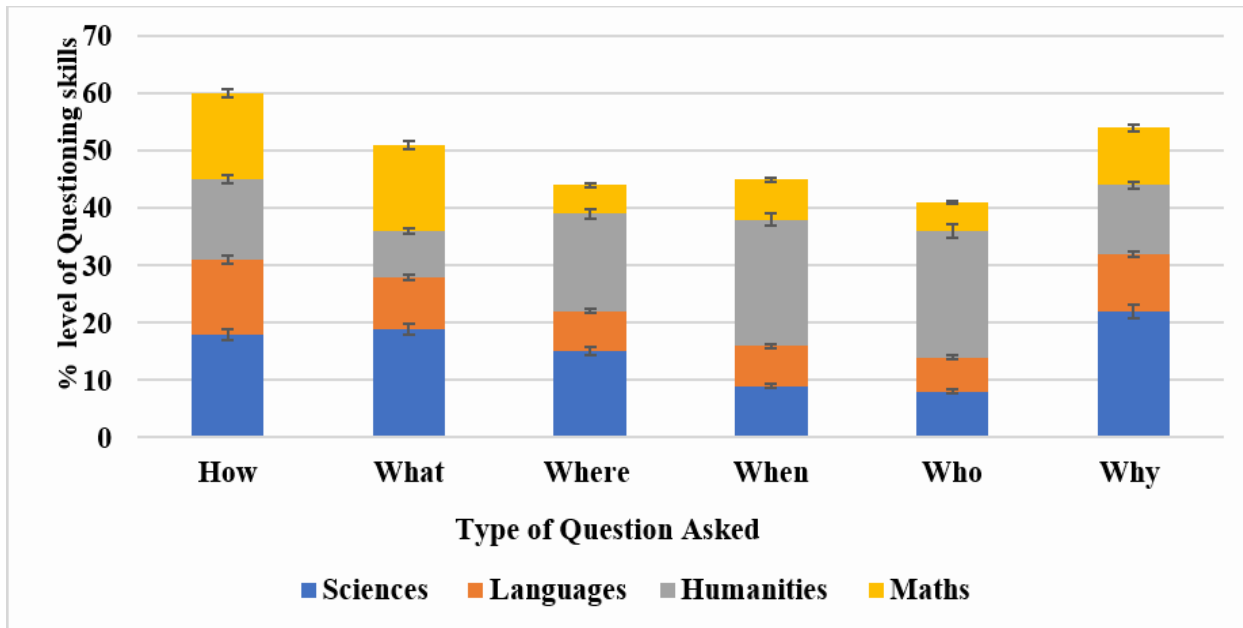


Figure 3. Analysis of question formulation skills of students based on the type of questions asked in various categories of subjects in secondary schools in the South Eastern Region of Kenya. Recent studies have shown that QFT can broaden students’ knowledge on topics that are not particularly covered in depth, (Pavlina, 2023).

It was observed that the QFT approach was a paradigm shift from the traditional learning. This is because normally students are traditionally trained to expect teachers to ask them questions. But in QFT it was the teacher who was expecting questions. The challenge of adjusting to QFT and coming up with answers solicited a learning environment which needed deeper collaboration, and engagement between teacher-students and student-students’ scenarios.

The teachers were even more excited to learn better strategies of stimulating curiosity among learners. This professional prompt, caused the teachers to engage more in the online platforms and even to observe other teachers teaching similar topics. It enabled them to create communities of practice which benefited more from the online link which could be assessed any time due to connectivity. Our observation found that the provision of materials for discussion and mentors was quite valuable for these communities of practice in stimulation professional growth of teachers and performance of the students.

DISCUSSIONS AND CONCLUSIONS

QFT and Stimulation of Curiosity in Lifelong Learning

The most important goal of any teacher is to stimulate the curiosity among the students (LeBlanc, 2017). Studies show that questioning is central in promoting curiosity (Larsen, 2020). Stimulating curiosity

empowers learners to be able to continue learning and exploring the course materials after the lesson and seek connections with other relevant information during their career life. Therefore, questioning is very important in the teaching and learning process as it was recently observed that it increased student engagement up to 71% (Cummings, 2020). Studies have shown that student engagement is a factor in good academic performances (Chase et al., 2014). However, engagement was found to be influenced by the different types of experiences students have in the classroom (Malloy, Parsons, & Parsons, 2013). Hence, this emphasizes the need for students to be trained in the art of Question Formulation and teachers to be trained on how to spur curiosity. Students should be made aware of what they do not know and be consistently trained to articulate what they do not know in the form of a questions which creates the essence of QFT. Our observation of the two aspects of Curiosity and QFT and the outcomes which they elicited in the various schools, subjects and topics made us to link it to lifelong learning phenomenon as shown in equation 1 below.

Equation 1

Curiosity + Question Formulation Techniques = (Motivation+ Empowerment) Life-Long Learning

Abbreviated as:

C + QFT = (M + E) LLL

This curiosity was defined as the level of learners' intrinsic and extrinsic drive, excitement, interest, and desire for exploration on a particular issue (Qfocus). In education, Arnone (2003) identified ten structural strategies that have been put forth as triggers of curiosity. These included thought-provoking question or statement, creating an environment that encouraged questions, the provision of enough time to explore without causing anxiety.

Therefore, in this context, the QFT enables learners to generate many focused questions. It is from these many questions, that a learner can choose research questions. The QFT is learner centered and majorly semi-guided. The Curiosity-Based Learning (CBL) has been acclaimed to be a good learning tool. It can be delimited as pedagogical framework, similar to Inquiry-Based Learning (IBL) that sets learners inquisitiveness and Problem Based Learning (PBL) that aims to stimulate learner self-reliance and self-directed learning (Minigan, et. al., 2017; Jackson and Ward, 2012).

CONCLUSIONS

The Question Formulation Technique (QFT), is a powerful yet simple teaching strategy that teaches teachers to form a question focus based on lesson objectives and also trains students how to formulate, work with, improve and use their own questions. As a result, students become more confident researchers and get trained on the role of question formulation in the learning process. It has been found that, when students are coached in the QFT, they become responsible in coming up with better questions. For them to be able to come up with a question, they have to mentally interact more with the content. Our study observed the surprising that the learners sometimes asked questions which the teachers had never anticipated. The teachers have realized that when students learned and practiced the QFT, they gained the ability to go deeper and faster into the content than expected. This was observed to cause the leaners to complete the curriculum faster and to be well prepared for the summative examinations. The students seemed to retain more content and developed deeper understanding of concepts. Studies by Garibay et al., 2020, have also shown that the QFT protocol can be used as a strategy for formative assessments for the Competency Based Curriculum (CBC).

The Inclusivity and Innovativeness of QFT

The QFT was found to have the capacity of being more inclusive and created a learner centered learning. This was because the learners were found to be more enabled in asking what interested them and was useful to them without worrying about their past experiences. Therefore, the QFT requires every question to be valued equally because they are usually based on the learners needs and expectations. Hence, the traditional way of inquiry is passed from the teacher to the learners. The learners are trained and become experienced in creating their own questions without worrying about any possible answers. This makes the learners to be more innovative, creative, reflective and good problem solvers. Studies have shown that self-questioning or the metacognitive strategy in which student formulate their own questions is one of the most effective metacognitive strategies. Other studies also showed that engaging learners in a pre-lesson self-questioning improved students' rate of learning by nearly 50% (Hattie, p.193).

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