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POSITION STATEMENTS ON INTRODUCTION OF STEM (SCIENCE, TECHNOLOGY, ENGINEERING AND MATHEMATICS) EDUCATION IN GHANA

1. Introduction

The Art Teachers' Association of Ghana (ATAG), a registered professional body at the forefront of Arts education delivery in Ghana, with membership comprising of seasoned Art Educators at both pre-tertiary and tertiary levels of education in Ghana present our official position on the recent adoption and implementation of STEM (Science, Technology, Engineering and Mathematics) educational policy by the Ministry of Education and the National Teaching Council.

The National Teaching Council in collaboration with the Ministry of Education organised stakeholders meeting on August 10, 2021 in Accra on the theme *'STEM Education in Ghana: What Ought to Happen'.* We observed that the eminent scholars invited for the presentation on the said date were drawn from science, engineering and mathematics background just as the theme suggested. The incisive presentations from these scholars hammered on the aforementioned subject areas – Science, Technology, Engineering and Mathematics – as key in training the twenty-first century learner in Ghana.

However, drawing cue from best practices of advanced and developing nations who are making giant strides in inventions and innovations points to the fact that those countries have prioritized certain fields of study we (in Ghana) have neglected in addition to Science, Technology and Mathematics. Based on best global practices, **ATAG make its position clear on the continuous exclusion of Arts Education in the promotion of Science, Technology, Engineering and Mathematics (STEM) education in Ghanaian educational policies.**

2. Brief Historical Background of STEM Education in Ghana

Since the country attained independence in 1957, there have been efforts by different governments to promote Science and Mathematics education. At the beginning of the country's formal school education system, it prioritized Science and Mathematics and later included Technology. The nation's concentration, therefore, dwelled on Science, Technology and Mathematics which became known as STM. For over four decades of attempts at promoting the aforementioned fields of study in Ghana, the nation has not made any creative and innovative contributions to global basket of Science and Technology inventions. The resolve of the Ministry of Education to introduce STEM

(Science, Technology, Engineering and Mathematics) education is laudable. However, ***the exclusion of the 'Arts' in the said policy has serious implications and consequences on the success rate and holistic development of creative and inventive learners.***

3. STEM Education in Ghana and Recommended Policy Alternative

In the continuous quest to accelerating national development, the educational systems of both developed and developing nations have over the years witnessed policy alternatives. In the case of Ghana, past and present governments have initiated many major policies to finetune the educational sector for the holistic development of learners. One of the newly introduced educational policies which is to become a core component of the Ghanaian education system is Science, Technology, Engineering and Mathematics (acronymised as STEM). **The philosophy behind the STEM policy is based upon the idea that the study of Science, Technology, Engineering and Mathematics in schools could produce the best and innovative brains to become scientists, engineers and architects to drive national development. This notion of STEM education being the sole magic wand to producing capable workforce to drive the desired national development has made Ghana governments (past & present) and their supporting ministries and agencies to continually allocate more resources for the advancement of STEM education in the country.** Based on the historical trajectory and observation of the workable happenings in advanced countries, the position of the Art Teachers' Association of Ghana on the exclusion of the Arts is as follows:

1. The general observation is that the STEM education system does not produce the much-expected STEM-capable graduates let alone producing graduates with 21st century competencies outside STEM curriculum to address the changing developmental needs of economies across the world. It is so because, **no country has ever developed in the absence of effective Creative Arts education, for Science and Technology thrives in the presence of arts education.** The fact remains that STEM curriculum is not a magic bullet for innovation **but rather, a focus on STEAM which includes that Arts integrates design principles, concepts, techniques, visual thinking, and creative problem-solving skills in learners.** Application of this is evidenced in countries that consider a STEAM curriculum instead of STEM.

2. Advanced countries such as China, USA, UK, France, Malaysia and Singapore have rigorously shifted from STEM (Science, Technology, Engineering and Mathematics) to STEAM (Science, Technology, Engineering, Arts and Mathematics) and or STREAM curriculum because ***they acknowledged that the pursuance of science, technology, engineering and mathematics education are enablers since the resultant must be a product, which is mostly physical manifestation of artificial intelligence.*** For this reason, ***they do not***

downplay the Arts, which has to do with product design and development. STREAM suggest inclusion of 'Robotics' to 'Science, Technology, Engineering, Arts and Mathematics.'

3. Studies have revealed that **for a true innovative education, the inclusion of the Arts extend students' critical thinking skills and provide multiple lenses through which they explore the world around**. It is based on the justifiable impact of Arts on students' learning that led to the modification of the STEM policy to STEAM and STREAM respectively with the 'A' in both instances representing the Arts and 'R', Robotics or Reading. The introduction of the 'Arts' into the prioritised disciplines demonstrates the dependency of the disciplines - Science, Technology, Engineering and Mathematics on Arts "**because no great products were ever**

   created without artistic sensibilities" (Stephen, 2015, p.2). Due to this, the world's much talked about technologically advanced nations such as China, United States of America, Singapore, Korea and others have adopted and promoted STEAM or STREAM curricular which is worthy of Ghana's emulation as they produce graduates with high degree of inventiveness, innovativeness and creativity.

   The people of China are grasping all the expertise they could concerning STEAM education because they believe STEAM education has the tendency to "allow the labels of the future to say "invented in China" rather than "made in China." **It's a cash cow, having your citizenry trained via STEAM because it makes students more creative, innovative, inventive and more empathetic.**

4. Studies have shown that students in STEAM classrooms tend to outperform their counterparts in STEM-only establishments. This makes the STEAM the recommended pathway for the holistic education of the Ghanaian learner.

3. Conclusions

In the quest for a robust educational policy that would produce the best and innovative brains to become scientists, engineers, product designers and architects to drive the development of Ghana, **the Art Teachers' Association of Ghana calls for a paradigm shift from the current focus on STEM policy to STEAM (Science, Technology, Engineering, Arts and Mathematics) or STREAM (Science, Technology, Robotics / Reading, Engineering, Arts and Mathematics) policy for the entire pre-tertiary and selected tertiary school levels to engender creative, innovative and inventive learners for accelerated national development. STEAM education is known to foster pure innovation that comes with team work and critical thinking skills of scientist or technologist with that of an artist or designer. It enhances interdisciplinary learning for better results.** With STEAM or STREAM education, students are presented with a more

authentic vision of science in Arts and the Arts in science. Therefore, **it is our position that the education ministry should reconsider its pursuit of STEM policy in Ghanaian educational curriculum and urgently prioritise STEAM that incorporates Arts Education as the robust vehicle that could realistically and forcefully drive creativity and innovation in learners**.

It is not enough to have engineering-based tertiary institutions to organise pre-university entry programmes for Visual Arts students to offer them the opportunity to do Engineering. If per the creative doings of the Visual Arts students, the nation finds them capable of perusing engineering courses as part of their training in Visual Arts, why not introducing STEAM instead of STEM. The solution lies in running STEAM policy to train them from early stages of their education through to tertiary.