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Development of an Integrated Art and Visual Programming Framework for Ghanaian Basic Schools based on a 21st century skill deficiency diagnostic on two basic school subjects

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Abstract

Owing to the innovative and technological intensification in the modern age,21st century skills have become a necessity for survival in the digital age. As the purpose of every education system is to make capable graduates to fit and function effectively in their environment, these skills have become inevitably relevant. Artmakes use of creativity, exploratory and imaginative skills, thus giving learners the urge to unearth and nurture talents. Programming is necessary for every student because it enhances 21st century skills in addition to logical thinking skills. When children get exposed to the concepts of art and programming early, they secure a good foundation for success in any 21stcentury career path. Evidently, in basic school level, teaching and learning activities are deficient of 21st century skill development components. The study employed Qualitative design and descriptive statistics, selecting 9 respondents: Curriculum Developers (3) and ICT teachers (6). This paper therefore presents a review of two essential subjects: Information Communication and Technology (ICT) and Basic Design and Technology (BDT). These are subjects of study in Ghanaian Junior High Schools. It also presents a conceptual framework to remediate the deficiency, and to enhance the development of the 21st century skills.

Keywords: Computational Thinking, Creativity, Basic school, critical thinking, Digital fluency, 21st Century Skills

1. Introduction

Art and Programming are two fields of study noted for the building of a wholesome individual. These two domains are inevitable because of the unique skills each of them nurtures in learners. Creativity, Critical Thinking (CT) and Digital fluency (DF) skills are some of the major skills brewed in these fields of study.

Kohl (2007) identified Art as a very versatile and open field for exploration and creativity. Art offers an expansive scope to its content, in addition to welcoming diverse approaches to doing things. The area recruits the innate talent of creativity in every human. Art covers both visual and performing arts, as both areas make use of creativity, exploratory and imaginative skills, thus giving people the urge to unearth and nurture talents. Martin (2014) identified several benefits of art in education to children. Some of these are creativity, motor skills, confidence, decision making, perseverance, focus, and collaboration. Everybody needs art because everyone is born an artist. The challenge is how to nurture and sustain these artistic traits as we grow.

Computer Programming (CP) can be traced back to the advent of computers. This craft has matured over time, and there are a variety of programming languages today. Programming as a craft is not only a vocational skill but also a recipe for critical and creative thinking. Programming is another unique area that offers testing of different variables in solving a problem. It offers an environment of bringing one's imaginations into the glare of others. According to Tuff (2014), programming does not only promote positive qualities, it is also noted to develop analytical abilities in problem solving.

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In addition, learners' logical thinking abilities can be boosted for real life stressful conditions. Programming offers the opportunity to learn exclusive problem-solving and design strategies (such as modularization and iterative design) that spans over to non-programming spheres. Since programming comprises the conception and external representations of your problem-solving ability, it offers the platform to reflect the scheme of one's thinking. Jobs (1995), in the "Lost Interview", affirms that, computer programming is a requisite lesson for all, because it nurtures reasoning traits.

Visual programming language (VPL) is any programming platform that permits manipulation of graphical program components (blocks) other than textual instructions (Jost, Ketterl, Budde&Leimbach, 2014). VPLs, according to Bragg and Driskill (1994), make use of boxes, diagrams and other screen elements connected with arrows or arcs to represent their relations. They allow users to manipulate graphical or iconic elements in some precise spatial syntax for program structure/assembly. It thus offers an ideal environment for training beginners especially children in the programming craft.

Information and Communication Technology (ICT) thought of to be the domain for computational thinking has been made compulsory at all levels in Ghanaian basic schools. Creative art has also been integrated into the curriculum, to enhance pupils with its benefits. Various policies have emerged in ICT education focusing on developing critical thinking and problem-solving skills, creativity and imagination, student leadership, collaboration and communication, digital literacy, as well as good citizenship habits, the latest being the ICT for Accelerated Development (ICT4D)

Although Art and ICT have been integrated as essential subjects in the basic education curriculum, there is a blurred notion of their essence and content. Conventionally, these two spheres are mutually exclusive with little or no cross application. Consequently, this causes the essential skill deficiency in the learner up until the tertiary levels. Djangmah, cited in Acquah (2015), argues that Ghana's educational system is deficient in consistently imbibing the skills that are relevant in the industry. Despite the numerous advocacies by proponents, majority of graduates churned out each year evidently lack essential skills for this modern age (Odame, 2016; Baah-Boateng &Baffour-Awuah, 2015).

This paper therefore presents a review of two subjects: Information Communication and Technology (ICT) and Basic Design and Technology (BDT), and also presents the conceptual framework to guide remediate the deficiency, so as to enhance the development of the 21st century skills.

2. Review of Related Literature

2.1 Art Education in Ghanaian Basic Schools

Universal education has been a political focus of Ghana since independence in 1957. The essence of education is not missing in Ghana's vision of achieving future prospects, thus the establishment of a Ministry of Education, to take charge of administration and the coordination of educational issues.

According to Edusei (2004), formal education dates as far back as the arrival of the missionaries in the country. However, there was intense phobia for art inclusion in education because of its close association with the indigenous culture, which was considered fetish. In 1908, art was first introduced as a subject into the Ghanaian (then Gold coast) educational curriculum as "Hand and Eye", to break the monotony of theoretical classroom activities. It consisted of practical hands-on activities and since then has undergone numerous reforms up till date.

In the 1987 Educational reform programme, Visual Art was integrated into the school curriculum under the Vocational Education Programme. At the basic level, there were ten (10) art-orientated vocational subjects within the main curriculum out of which a school chose two (2) and presented one for a national examination and certification. These 10 options were Basketry, Ceramics, Textiles, Beadwork, Sculpture, Paper Craft, Picture Making, Graphic Design, Leather Work and Calabash Work (UNESCO, 2001). At the senior high level, art components are taught as elective courses such as General Knowledge in Art, Graphic Design, Picture Making, Textiles, Jewelry, Sculpture, Ceramics and Leather Work. Tertiary education offers art in various programs of study, with both visual and performing arts as either part of the formal curriculum or extra-curriculum. Currently, art education is taught in the primary school level as Creative Arts, and in the Junior High school as Basic Design and Technology (BDT). The BDT syllabus is loaded with a variety of art-related courses for schools to choose from.

As Brobbey (2015) confirms, Creative Art education is noted as an ideal and effective way of fostering creative thinking in learners so as to equip them with requisite skills for facing the competitions of the age.

Admittedly, Brobbey identifies several crises militating against art education in Ghana. Some of these are negative perception of the study and poor teaching methodology. These defects have cost most Ghanaian graduates so much as to render Ghana's educational system ineffective in the 21st century (Acquah, 2015).

2.2 Teaching of ICT in Ghanaian Basic Schools

Teaching of ICT unlike many other subjects requires both theoretic knowledge and practical expertise, with a good command over the subject. Previously restricted to matured learners as "computer studies", ICT now transcends to pupils even in lower primary schools (Freedman, 2001). ICT courses often misappropriate efforts to teach only the "Technology" (Reffell& Whitworth, 2002). The technology aspect of ICT is least important in teaching, since technology changes over time. The fairly constant concepts in ICT are concepts of data handling, management, and conversion into information. These constants need to be the focus of every ICT education, lest society still suffers digital divide as technology advances (Opoku, 2004). According to Freedman (2001), topics like Email, Word, Paint, must only appear as examples so that main topics such as "exploring", "idea development and execution", "exchanging and sharing information" and "reviewing, modifying and evaluation as work is in progress" stand out. Obviously, this is not the requirement spelt out in the Ghanaian ICT syllabus for basic school level.

Aside lesson periods, ICT facilities in many public schools are often inaccessible; these facilities are either engaged or non-functional, thereby depriving pupils the opportunity to rehearse skills learnt in class except for those who have computers in their homes.

Lack of technical support and skills development for art teachers has also militated against effective teaching of ICT over the years. The canker renders teachers lacking in modern ICT knowledge and skills unable to keep their learners on top of related issues. The Ministry of Education (MOE), in an effort to empower teachers for better performance, has selected some 31,000 teachers from across the country to undergo an on-the-job ICT training (Ghana News Agency, 2015).

2.3 Visual Programming

The dream of many to learn programming has always been obstructed by coding ethics and concepts. But as programming evolves over time, bringing forth a variety of languages, more and more people are finding their place in this craft and vocation. Different programming languages employ different programming paradigms. Visual programming Language (VPL) refers to programming tools/platforms that allow manipulation of program components/commands, graphically other than using text-intensified instructions (Jost, Ketter, Budde&Leimbach, 2014). VPLs, according to Bragg and Driskill (1994), make use of boxes, diagrams and other screen elements connected with arrow or arcs to represent their relations. VPLs can be categorised into icon-based languages, form-based languages, and diagram languages, depending on the kind and level of visual elements available. VPLs allow users to manipulate graphical or iconic elements in an interactive and grammatically distinct pattern for program development. It thus offers an ideal environment for training beginners especially children in the programming craft. The list of VPLs is inexhaustible with new ones emerging periodically. Some examples of VPLs are Flowol, Kodu, Cameleon, Nuke, Mama, Grasshopper, Alice, Squeak Etoys and Scratch.

Visual programming tools are the most ideal for all beginners especially children. This is because they employ more graphical tools and thus avoid syntax issues. There are also lots of sprites (elements) and high-level operations to make work easier and fun. Remixing is another great feature for beginners and all these are available in VPLs, and "Scratch" specifically.

3. Methodology

3.1 Design

Qualitative research design is preferred for the study because the study mainly involves review of syllabus and lesson delivery modalities, and development of a framework based on content.

3.2 Method

The research method adopted was Action research. This methodological choice is appropriate because the research requires the study of an existing system alongside a systematic data collection (Bogdan &Biklen, 1992) and concurrently working at developing an intervention, as what is considered a hypothetical solution to the problem.

3.3 Population and Respondents

The target population for the study included ICT teachers and curriculum development experts. The accessible population is as exhibited in table 1.1. Eventually, the total accessible population for the study is 9 respondents

3.4Sampling Methods

Purposive sampling was adopted in selecting respondents (curriculum development experts and ICT teachers) in soliciting expert information for the syllabus review and framework development. This sampling method is backed by the submission of Agyedu, Donkor and Obeng (1991), that purposive sampling allows researchers to deliberately sample only respondents whose expertise/knowledge are essential in comprehending the subject under investigation.

Table 1.1: Accessible population for sampling experts

Curriculum Development Experts	3	3
ICT Teachers	6	6
Total	**9**	**9**

Source: Researcher's construct

3.5 Instrumentation

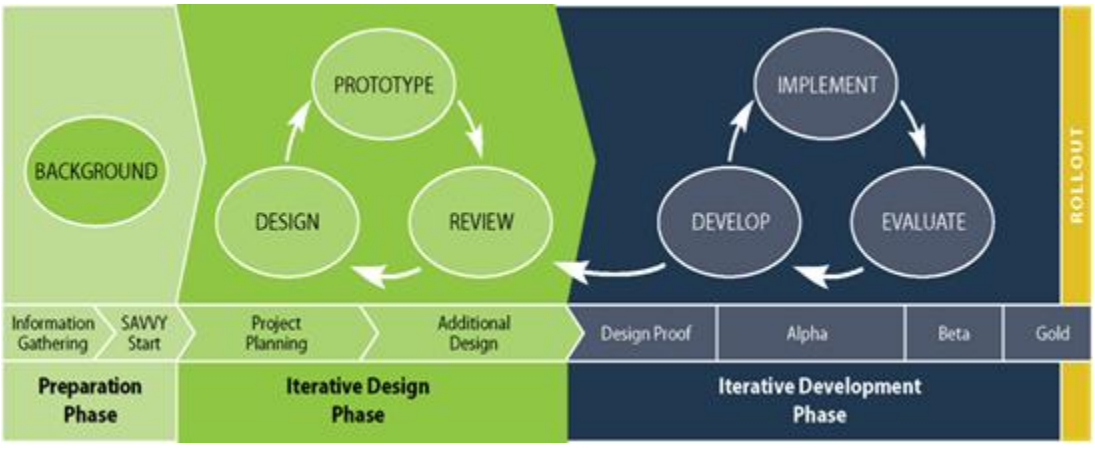
The study employed interviews, document analyses, and focus group discussions to solicit for relevant information. This combination of multiple tools for data collection is called triangulation (Asinyo, 2009).

4. Findings, Analysis and Outcome

4.1 Execution Scheme: Successive Approximation Model

The Successive Approximation Model (SAM) as described by Allen Interactions (2015) is an Agile Instructional Systems Design model which was developed as a substitute or improvement on the rigid process of Analyze, Design, Develop, Implement and Evaluate (ADDIE).

Fig. 2 The SAM Instructional Design Model. Sourced from Allen Interactions (2015)



4.1.1 Preparation Phase:

This is the initial phase of the agile model. It is a stage of relevant information accumulation, instead of an outright jump to an already-laid-out assessment of the existing or "required" content.

4.1.1.1 Data Collected

Owing to the qualitative nature of the first phase of the study, data gathering was primarily geared at soliciting for expert knowledge to fulfill set goals. Preceding analysis of the content of the ICT and BDT syllabus was done by the researcher and then followed by soliciting expert opinion on review and intervention.

4.1.1.1.1 Observations and Analyses of Syllabuses

4.1.1.1.1.1The Basic Design and Technology syllabus

The BDT syllabus is undoubtedly a comprehensive and exhaustive one for pupils. The Basic Design and Technology (BDT) subject was introduced at the Junior High School level, purposely to bring to light the importance of design and technology in promoting technical education and industrialization, and also equip pupils with various vocational or industrial skills for entrepreneurial development. All the three-core areas of the syllabus (Pre-Technical Skills, Home Economics and Visual Art) are all well addressed and distributed throughout the course structure.

The syllabus serves as a complement to all the other subject areas treated in the Junior High school curriculum. As postulated by the P21 framework (2006), the BDT syllabus is extensive in imbibing essential, practical and contextual skills. In addition to these skills, the subject has entrepreneurial skills, which make pupils business conscious and also equip them with basic entrepreneurial startup abilities.

The main challenge faced by this subject, despite its flamboyant indications, is with recognition among educators as well as students. The BDT course is considered almost extracurricular, and thus attracts little recognition or infrastructural input from educators as compared to subjects like Science, Mathematics and English language. This ill-attitude hinders the positive will and attention given to the subject by majority of students.

4.1.1.1.1.2 Analysis of the ICT syllabus

a. The aims of the syllabus although relevant, seem to only create an awareness in pupils and grant them basic skills of using a couple of office tools. The syllabus lacks lessons to imbibe majority of the skills of fluency with the web, text, audio, animation, video, remixing, design, downloading and uploading, and fluency in critical thinking, collaboration and deciding relevancy, as identified by Resnick (2002).

b. The ICT syllabus has so many vague topic repetitions, with some of them being too concise to be main topics; these could have been covered as subtopics. First year, term two, section one has the topic, "typing keyboard symbols", a topic too narrow to stand alone. Nevertheless, this topic was repeated in 2nd year section three. A similar lesson is "computer viruses".

c. At the tail-end of the syllabus lies the topic "Integration of ICT into Education" (Section 20). This is a topic that should be treated in the early stages in order to broaden learning scope of learners as well as give them practical uses of the computer in their learning environment. Having this lesson at the early stages of the curriculum would give the opportunity to engage computers and the internet as learning tools, other than mere article of study.

d. With much time spent on repetitious lessons, learners are expected to undertake a project in Paint Brush, whereas there is no reflection of a lesson on it through the three years' curriculum.

4.1.1.1.1.2.1Curriculum Developers:

The interaction with the 3 curriculum developers was tailored at soliciting their views on the current teaching and learning of ICT in schools, and their expectations of the proposed framework (See Appendix B for interview guide).

On ICT education there was unanimity of view to the fact that, the entirety of Ghanaian education needed an upgrade because the classroom-to-field gap is obvious. It was also agreeable that the current ICT syllabus needed an upgrade to cater for modern concepts in ICT. Two out of the three categorically affirmed that, the Curriculum Research and Development Division of the Ghana Education Service (CRDD-GES), has constantly been on the lookout for content that would reflect the 21st century skills (4Cs: Creative and Innovative skills, Critical thinking and problem-solving skills, Collaborative skills and Leadership skills, Communication skills -Literacy and numeracy).

They however noted some anticipated challenges to the implementation of the framework. This is with the uneven resource endowment of target schools. They identified characteristics of schools based on the variable resource endowment:

i. Schools with fully functional computer laboratories and Internet Access
ii. Schools without computer labs but a few computers for demonstration
iii. Varied teacher competencies.
iv. Class sizes and student to computer proportions
v. Administrative challenges to learner accessibility to ICT resources in schools
vi. Lack of computers in homes which could inhibit learner practice outside classroom hours.

It was also noted that, due to the implementation of the ICT4D policy and the "One Laptop per Child (OLPC)" initiative by the Government of Ghana (2007), Junior High Schools have been/are being furnished with laptop(s).

On expectation for the IAVP framework, all three curriculum experts expect to see the 4Cs as core to its development and implementation to make it a viable tool for teaching and learning.

4.1.1.1.1.2.2 ICT teachers:

The discourse with the 6 ICT teachers was with the help of a semi-structured interview guide (see Appendix D). The scope of the discourse includes:

a) Views on the current ICT syllabus
b) The state of ICT infrastructure in schools, and teacher competencies.
c) Expectations for improvement and/or maintenance

***a)*Views of the current ICT syllabus**

From the discourse the following were retrieved:

5 out of the 6 (83.3%) respondents submitted that the current ICT syllabus for JHS is outdated and needed to be reviewed. The remaining respondents (16.7%) indicated that the syllabus is ideal for their level. They also noted that the content of the syllabus is based on the 2003 office suite, which is an old version of the Microsoft suite. This makes teaching and learning difficult since the computers the schools have all run later versions of Microsoft office and these poses inconsistencies in graphical user interfaces when it comes to relating theoretical lessons to practical lessons.

All the 6 unanimously agreed that the syllabus is filled with so much needless repetitions and topics that could be captured as subtopics. (E.g. Keyboard skills and Computer viruses). Notably, all of them stressed on the repetitive nature of lessons. This forces them stretch topic unnecessarily over the span of two years, and eventually dedicate the entire 3rd year to revision.

All the 6 respondents are unanimous on the fact that the ICT syllabus is largely centered on Microsoft word and Excel, ignoring other relevant aspects of ICT education. As expressed by one, "There are a lot of things pupils need to know which are not captured." Moreover, Microsoft word and Excel are just examples of the vast class of text editing and spreadsheet software. Hinging the entire curriculum on just these two products can pose learning problems, especially when these products are discontinued. ICT education is not only about learning how to type and format text in Microsoft word.

***b)* The state of ICT infrastructure in schools and their usage.**

The schools assessed are the six randomly sampled schools from which the teachers were selected. They are KNUST JHS, Weweso Municipal Authority JHS, Ayeduase Roman Catholic JHS, Kotei Roman Catholic JHS, Infant Jesus Lumen Christi JHS and Paradise Earth Educational Centre JHS.

i. **Availability of Computer Functional Computer Laboratories:** 2 out of the six schools (33.3 %), have a fully functional computer lab with internet access. 3 out of the 6 (50%) have computer labs without internet access and 1 (16.7%) school has laptops for demonstration without a lab. In all, all the schools have at least a computer. Of these categorization, the Government-owned schools fall within schools with computer labs with internet, and schools with just functional computer labs.

ii. **Learner to Computer ratio:** Learner to computer ratio was variable across all six schools. The study realized the following ratios: 2:1, 4:1, 5:1, 6:1, 7:1, 11:1. The school with the highest learner to Computer ratio (11:1) is a private school.

iii. **Teacher competencies:** 5 out of 6 schools (83.3%) of the teachers interviewed have trained teachers in ICT education. 1 out of the 6 teachers (16.7%) is not a trained ICT teacher. Notably the untrained teacher teaches in one of the private schools under study. All 6 (100%) respondents (teachers) are apt in basic ICT skills.

2 out of the 6 (33.3%) have advanced skills (knowledge and skills in application software and knowledge or programming and/or networking).

***c)* Expectations for improvement and/or maintenance**

All 6 respondents (100%) agreed on the need for improvement and updating of the syllabus. Regarding the kind of improvements, they all stated update of the syllabus content. They also requested for a mechanism that would ensure flexibility in updating learning content based on modern trends. 2 of the respondents (33.3%) categorically stated the need for more interesting, dynamic and innovative learning activities other than routine typing skills projects. They however could not give an example of such an activity when asked for one.

4.1.2 Iterative Design

This segment commences with the Savvy start, which is the preliminary collective brainstorming stage meant to lay the grounds for a perfect project. This stage is focused on sorting and reconciling the gathered data and also planning the rest of the project. This yielded the consolidating of the CRDD-4Cs and the P21 skill list, into a comprehensive list, which would be the focus of the framework. At this stage, four functional principles/rings were identified for constructing the framework.

1. **Ring one:** *(Contextual and local exemplifications: Relevance of Education)*
2. **Ring two:** *(Reward for creativity and innovation: Motivation to solve problems)*
3. **Ring three:** *(Inter-disciplinary correlation: Exploration of all sectors for applicative opportunities)*
4. **Ring four:** *(Skills development and Information and media literacy: Usefulness of learners to society)*

4.1.3 Iterative Development

At this phase, the developer, having arrived at an ideal design/prototype from the previous stage, commences with a design proof, continuing through Alpha and Beta stages and eventually outputs the Gold. The iterative development stage, after a series of review by the curriculum developers, necessitated the addition of an additional principle/ring to the initial four. Thus "Gold" framework has the following functioning principles:

1. **Ring one:** *(Contextual and local exemplifications: Relevance of Education)*
2. **Ring two:** *(Reward for creativity and innovation: Motivation to solve problems)*
3. **Ring three:** *(Inter-disciplinary correlation: Exploration of all sectors for applicative opportunities)*
4. **Ring four:** *(Skills development and Information and media literacy: Usefulness of learners to society)*
5. **Ring five:** *(Group works and Project and Problem based activities: Team-work and good interpersonal relation skills)*

4.2 The IAVP conceptual Framework

Having considered all the information gathered from the intellectual inquiry, the researcher came out with the IAVP framework, which is a proposed conceptual guide for learning content development, teaching, learning and the practice of modern ICT at the basic school level. The IAVP framework is developed to ignite and nurture 21st century skills in learners. It posits that, learning of Art and ICT should inherently spark and foster in learners, the skills of Creativity and Innovation, Digital Literacy and Fluency, Collaboration and Communication skills, exploration and problem-solving skills, Critical thinking and analysis, leadership skill and an intrinsic motivation to learn.

To achieve these, the framework builds a bond between evolving needs of society/ industry, and learning activities in the Classroom. It holds that, learning content and activities in the classroom should be evolving in order to be relevant for the necessary skills development for the society, whereas evolving societal needs also influence the goal of learning activities.

In entirety, the framework functions on five (5) relationships had drawn from societal needs and classroom activities. This relationship are paired-up principles between the classroom and society and in essence, ignite and nurtures the relevant skills, referred to as the 21st century skills. These relations are represented as "rings".

Primarily, the framework was befittingly developed on Art and ICT lesson integration. However, it could be adopted in principle for other spheres of study. The special choice of Art and ICT (Visual programming) is because these two areas copiously permit and inspire the articulation of all the principles of the framework. Martin (2014) identified several benefits of art in education to children. Some of these are creativity, motor skills, confidence, decision making, perseverance, focus, and collaboration. According to Tuff (2014), programming does not only improve positive characteristics. Learning the skills also enhances analytical skills in problem solving.

Ring one: *(Contextual and local exemplifications: Relevance of Education)*

This ring enshrines that in teaching and learning of Art and Visual Programming, classroom activities should primarily be centered on the environment of learners. Lesson examples and concept explanations should first be taught with traditional/local concepts and, if necessary, foreign backups can be adopted. When this is achieved, the relevance of education becomes visible and essential to the learners right from the classroom. This nurtures the habit of relating learning outcomes to societal activities.

Ring two: *(Reward for creativity and innovation: Motivation to solve problems)*

Solutions to problems do not come from reciting concepts, principles, theories and laws, but in their application. This ring requires that more focus be put on awarding learners' creativity and innovation, and less on memorisation. With this framework, intelligence and excellence is not determined solely by knowledge but with creativity and innovation as significant determinants. When this is done in the classroom, the classroom zeal is transferred to handling societal problems. Thus, the classroom activities become more realistic as they mimic industrial settings, which have problem solving, creativity and innovation at the core.

Ring three: *(Inter-disciplinary correlation: Versatility in knowledge and skills application)*

Learning of Art and Visual programming must not be seen as an end in itself, but a means to an end; thus, Art and visual programming (ICT) must be studied as tools and not subjects. In this ring, Art and ICT must always be extensively related to all other fields of study: mathematics, sciences, social studies, life skills, languages, etc. In this way, lessons learnt and skills developed in Art and visual programming lessons can be comprehended as applicable in all other areas. Consequently, these skills can be deployed anywhere a learner finds it useful, since learning activities have been fashioned in a universally applicative manner. This would then open up learners to explorative opportunities in other subject areas in the classroom as well as present opportunities to apply Art and ICT principles in less IT-concentrated environments.

Ring four: *(Focus on Skills development and Information and media literacy: Proficiency in Pragmatic delivery)*

This ring proposes that, emphasis should be placed on improving practical sessions (time allocation and content) in the computer teaching curriculum. Activities should be tailored towards relevant skill development and media literacy. For instance, learning activities can be fashioned to nurture collaboration among learners through group works and digital fluency, through challenging information handling tasks. Essentially the concept seeks to foster development skills in data storage and retrieval in practice other than theory.

Ring five: *(Group works with Project and Problem-based activities: Team-work and good interpersonal relation skills)*

This ring proposes that learning activities should involve group works and project- based activities. This principle in essence, fosters interaction among learners (group mates) thus enhancing their interaction, collaborative and problem-solving abilities. Essentially, working in groups would demand role-play which would also foster team-work ethics in learners. Problem based learning, a learner centered teaching approach, fosters learner engagement and relevant skill development. Outside the classroom, these habits materialise in learners' ability to collaborate with relevant skilled personnel for successful outputs. It would also eliminate the lapse of fragmented initiative due to the inability of a single person to be multi-tasking.

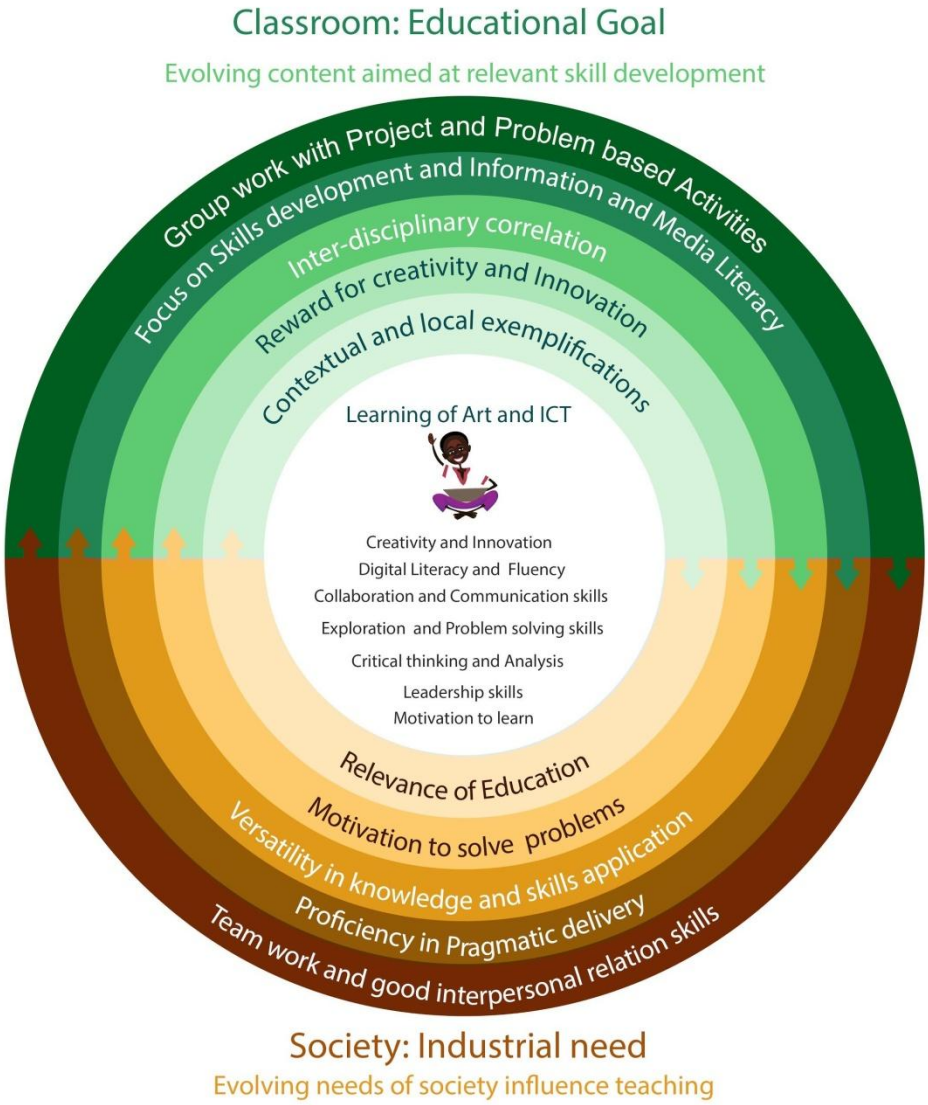


Figure 2. Graphical presentation of the IAVP framework

5. Conclusion

This study successfully expounds an intellectual enquiry into the phenomenon and presents outcome from reviews and interview, and how ideas were analysed and synthesised into the conceptual framework. The findings from the interviews are from discourses with experts in the field of education (curriculum developers and teachers). The intervention made use of societal/industrial expectations mapped unto possible classroom activities and principles in order to generate the required skills set out of this relationship. To evaluate the feasibility of the intervention, there is the need for evaluation of the framework, with real-life field test being the ultimate.

The world is faced with difficult and complex problems that need multi-faceted approach to solve. Educators and other stakeholders in education have consequently elevated a set of skills and knowledge that learners/graduates must possess to be able to effectively articulate in this age. This skills-set are universally relevant no matter the sphere in which the learner finds himself. These skills include skills of Creativity and innovation skills, digital literacy and fluency, Collaboration and communication skills, exploration and problem-solving skills, Critical thinking and analysis skills, leadership skills, and the motivation to learn. Having undertaken this study fully, the following conclusions have been drawn:

The problem of relevant skill deficiency, especially in the ICT course is a real and substantiated one. Content and structural deficiency of the ICT syllabus as well as insufficient recognition for the BDT course is a canker to be addressed. The development of this all-inclusive and lucid conceptual framework for teaching 21st century skills dissolves the seemingly monstrous lump in the Ghanaian Educational system. The cry of the nation, which is inability of the Ghanaian educational system to meet up to the demands of the industry has been demystified with a pragmatic conceptual framework.

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