Development of an Instructional Resource (*sua ntɛm*) for Active Teaching and Learning of Colour Concept and Application in Visual Art

Justice Otoo
Lecturer, Department of Ceramics and Textile Design and Technology,
Takoradi Technical University, Takoradi, Ghana
Safo-Ankama Kweku
Senior Lecturer, Department of Ceramics and Textile Design and Technology,
Takoradi Technical University, Takoradi, Ghana

Abstract:
This study seeks to develop an instructional resource for active teaching and learning of colour mixing and application in visual art. This would assist students to develop experiential colour mixing methods and colour application skills derived from the new colour theory exercises. The tool would also provide knowledge for students and lecturers to appreciate how instructional media can enhance the understanding of colour theory and its application to colour work. It is the hypothesis that the sample instructional resource be used for active teaching and learning of complex of colour systems. The population was the School of Applied Art Takoradi Technical University. A sample size of 384 was use for the study, including students and lectures. Interviews and observation was used for data collection. Findings from testing revealed that the tool made teaching and learning of Colour as active as possible. The students were not subjected to passive roles during the instructional hours as was found during the observation of teaching and learning in the various classes prior to the innovation.

Keywords: Colour, Active teaching and learning, Colour concept, Instructional resource

1. Introduction

Colour exploration plays a vital role in the arts and other fields. To the artist, colour can be used to attract and direct attention as a means of giving organization to a composition. It can also be used to accomplish aesthetic appeal by a system of well-ordered colour relationship, to give spatial quality to a pictorial field, and as a healing therapy to the sick (Ocvirk, Stinson, Wigs, Bone, Cayton, 1998).

Colour is a vital tool in the domain of visual art and other analogous disciplines. It has the power to evoke emotions sensations, awakes sensibilities, engages the appreciator, creates order. These attributes of colour can be put under major themes like physiological, psychological and philosophical underpinnings.

These notions and knowledge of colour make it a very important aspect of study when it comes to the pursuing of allArt academic programmes. It serves as basics for any creative development. An understanding of the theory of colour and its application serves as a spring board for creative accomplishments of design task. Appropriate application of colour promotes effective communication in art or hinders the intended purpose during creative development.

This requires an experiential approach to the teaching and learning of colour in order to develop hands-on experience with colour and its application. This also requires the development of an instructional resource that will create an active, participatory and enabling environment for knowledge and skill transfer.

A well-known indicator among educators is that an educational experience involving the learner actively participating in concrete examples are retained longer than abstract experiences and the use of instructional media add elements of reality by providing such concrete examples (Abdelraheem & Al-Rabane, 2005).

This makes it necessary for teaching to incorporate examples that make it easy for students to understand what is taught. Some teachers however, tend to emulate the teaching styles or methods they were exposed to both as students and as pre-service educators. Theydo not engage their students most effectively in the teaching-learning process.

Kundu & Bain (2006) and Wilkinson, McNutt & Friedman (2003) have established that learning requires learners to interact with new information in ways that enable active inquiry. The use of instructional media therefore serves as a silent motivator that aids the teaching and learning process in any education field. In traditional classrooms where there are no instructional media, teaching becomes very monotonous and students have to mostly rely on rote learning.

It was noted that in the delivery of colour lessons most lecturers were less resourced in terms of the use of appropriate teaching and learning materials, implying that the traditional form of teaching through lecturing is what enables the instructors to disseminate information that the students require. The teaching of colour is therefore done in abstraction without necessarily any illustrations to make the concepts understood by the students.

Upon this basis therefore, the researchers design and developed an instructional resource (*sua ntɛm*) to test its feasibility as a tool for active teaching and learning of colour mixing and application at the School of Applied Arts in Takoradi Polytechnic.

1.1. Purpose
To design and produce a sample instructional media for teaching and learning of colour mixing and application.

1.2. Research Questions
What instructional resource can be used to create active learning for teaching colour concepts?
What instructional approach can be used for experiential teaching of colour application?

2. Review of Related Literature

2.1. Teaching
Teaching can be viewed as an activity or activities undertaken to help an individual to learn or acquire some knowledge, skills, attitudes or interests. Mangal & Mangal (2009) consider teaching as a system of actions intended to produce learning. Teaching is a planned activity that involves creating an environment to facilitate learning and motivating learners to have interest in what they are taught. To Farrant (1996), teaching is an activity that is designed and performed to produce change in learners' behaviour. Agbenatoe (2011) considers teaching as the presentation of information and experiences in such a way that the learners will be able to understand and apply the new knowledge to other situations. This makes teaching a process that aims at helping individuals to receive new knowledge, experience, skills, attitudes or interests and be able to apply them in other situations.

2.1.1. The Teacher
The teacher is a vital part of a teaching process. Mangal and Mangal (2009) establish that teaching is a "*triadic relation*" and "*tripolar process*" involving the source of teaching (human or material), student and a set of activities designed and manipulated primarily to bring changes in the behaviour of the student. This implies that teaching involves three main agents namely: the source of teaching being the teacher or the materials, the learner or the student and the set of instruction or activities designed.

2.1.2. Methods of Teaching Art
Methods are the means or ways that teachers use to teach material to students. The choice of methods depends on what the teacher wants to teach (content), who the teacher is teaching, and the level of competence expected (White et al., 2005). Art is a multifaceted programme of study, in that it has many options or subjects. Few authors have written on the methods of teaching art for different levels of learning. The following section takes a look at methods suggested by Campbell (2012).

Campbell proposes six methods of teaching art as Laissez-Faire, Discipline-Based Art Education (DBAE), Authoritarian-Dictatorial, Assigned Topic, Media Methods and Facilitator. In Laissez-Faire, students are given materials then it is up to them to create a self-expressive work of art. In this case, students work without interference or direction. The goal of DBAE is to develop an understanding and appreciation for art. This includes teaching theories, contexts, and the ability to create and respond to art. Course content is created around art criticism, art history, art techniques and the context the art was created in.

In authoritarian-dictatorial method of teaching, students are dictated to exactly what to do in a step-by-step manner. It goes with directions at every step. This is normally set aside for students who have low art ability. The assigned topic (or student-oriented method) is where a teacher serves as a motivator to get their students to express themselves, develop their confidence, abilities and perception in art along with their knowledge, skill and attitudes toward art. In art history, the teacher teaches chronologically starting from pre-history or with thematic lessons organised around periods or styles. In the media method of teaching, lessons are created around a certain medium such as, photography, colour theory, textiles printing, and painting. The focus is on knowledge surrounding that medium which includes various techniques and experimentation. This is used in the higher levels of learning.

The facilitator method of teaching engages the student and the teacher in a conference to decide the direction that a particular student should go. This works well with higher learning and with students who are motivated or at an advanced level. The students choose their media, topic and how to proceed with the help of the teacher. Campbell (2012) suggests that media method of teaching art that focuses on building knowledge through techniques and experimentation makes use of media. This means thatmedia are important tools and techniques in the teaching and learning of colour. They can provide and carry information to students and also build their interest regarding colour through experimentation.

2.2. Learning
Smith & Blake (2005) view learning as the process of acquiring new knowledge, skills, insights and attitudes. This implies existence of some knowledge, skills before an introduction of a new one. This confirms Kundu & Tutoo's (2004) assertion that learning is increasing knowledge to increase the capacity for effective action. They stress that the experience gained through this modification

requires an active process and not a passive observation. Similarly, Farrant (1996) says learning does not merely mean the accumulation of knowledge; it also implies an understanding of how the knowledge can be utilised. It can be deduced here that learning is the process whereby new behaviour is acquired or strengthened as a result of experience gained in the form of either perception or behaviour. This means that learning is an active and not passive activity that depends on the learner.

Leclercq & Poumay (2005) identify learning as a teaching event. They describe learning as a joint description of paradigms of a learner's and a teacher's activity. They indicate that learning is an activity where the learner receives, practices, and creates knowledge whiles in the teaching event the teacher transmits, guides and comforts. What this means is that true learning is said to have taken place when there is a progressive build-up of knowledge that will help students to do things they could not do before with constant assistance of a teacher.

2.3. Instructional Media

Ecker, Gelsinger & Johnson (2002) refer to instructional media as items such as books, other printed matter, video and audio recordings, and computer software, which are used as part of the instructional process. It is well known among educators that educational experiences that involve the learner actively in concrete examples are retained longer than abstract experiences. Instructional media add elements of reality by providing such concrete examples. Scanlan (2003) describes instructional media as all materials and physical means an instructor and teacher might use to implement instruction and facilitate learners' achievement of instructional objectives. These may include traditional materials such as chalkboards, handouts, charts, slides, overheads, real objects, flash card and videotape or film, as well as newer materials and methods such as computers, DVDs, CD-ROMs, the internet, and interactive video conferencing.

The terms 'instructional media' and 'teaching aids' are sometimes used interchangeably. According to Ecker, Gelsinger & Johnson (2002), 'instructional media' and 'teaching aids' are synonymous hence the former could be used in place of the latter. Briggs (as cited in Ruis, Muhyidin & Waluyo, 2009) affirms that media are physical means which are used to send messages to students and stimulate them to learn. On the other hand, teaching aids are used by teachers to impart and emphasize information, stimulate interest, and facilitate the learning process. The materials range from simple to sophisticated ones and they can be aural, visual, or computerised. From the above description, there are virtually no differences between instructional media and teaching aids. Instructional media and teaching aids have functions that help make learners to easily understand information that is presented to them.

Richard (1992) holds the view that media in general stands for television, radio and newspapers and that media is considered as a whole and as ways of entertaining or spreading information to a large number of people. Richard (1992) believes that teaching materials which involve the use of different kinds of media such as visual and printed media are sometimes known as multimedia or mixed media. There are various kinds of media but visual aids are the appropriate media for learners, particularly young learners.

In this age of technological advancement, the usage of instructional media has dramatically increased in the last two decades (Descy, 1991). According to Abu-Jaber as cited in Abdelraheem & Al-Rabane (2005), instructional media allow the growth of specific learning abilities and enhance intellectual and motor skills. The use of charts and models enables the teacher to present and illustrate many physical phenomena and issues easily and at the same time, allows them to focus attention on the characteristics of objects. Recece & Walker (2001) advise the use of learning aids to enhance students' learning experience and stress the link between poor learning with the failure to use visual aids. Similarly, an effective learning to the professional use of visual aids can positively affect students' achievements (Croft, 2000).

On appropriate instructional materials and resources for teaching art, Chapman (as cited in Ruis, Muhyidin, & Waluyo 2009) stresses that the resource for teaching art could be put into two categories: physical and human resources. Under the physical resources are the following items:

1. Audio-visual materials such as films, slides, filmstrips, television, audio cassette tapes.
2. Print media like charts, flashcards, and photographs.
3. Tangible aids such as models and replicas, samplers, real objects, gallery, display space and commercial toys.

2.4. Colour

According to Ocvirk et al. (1998) and Adu-Akwaboa (2010), colour is energy which has physical effect on us. Colour is simply the composition of white light, which is made up of seven colours in the spectrum; namely, red, orange, yellow, green, blue, indigo and violet. The colour of an object, according to scientific knowledge, is determined by the way in which it either absorbs or reflects the rays or waves of the spectrum colours (Ocvirk et al. 1998, Diane & Cassidy, 2005 and Adu-Akwaboa 2010). Thus, an object that reflects all the colours of the spectrum will appear white, whereas the one which absorbs all the colours will appear black. It can be inferred from the description that colour is what the eyes perceive when light falls on an object. Therefore colour cannot be seen without light, an object, and the observer.

3. Materials and Methods

The materials adopted for the construction of the instructional resource *(sua ntem)* are common and available on the market making it possible for similar constructions and development. The main determinant for the selection of the material for construction is the size and visibility during use in small, medium and large lecture rooms. This is because other traditional instruction media like white boards, flip boards and display charts were disadvantages when medium to large lecture halls are used. This instructional resource has

been designed to check the challenges of passive lecture type of teaching, problems of visibility when white boards and medium to large classes are involved, abstract teaching of colour concept as well as distortion of colour by light when projectors are adopted
The main structure is made up of treated wood which has the ability to withstand different climatic conditions, withstand infestation of wood borers, light weight wood to allow for easy transportation and handling, and a knock down approach for easy movement and storage.

3.1. Fabrication of Instructional Resource
In the fabrication of the instructional resource *(sua ntεm)* basic material and processes were adopted. This was to make it possible for easy reproduction. Bolts and nuts**,** Chipboard**,** Acrylic paints**,** Hammer**,** Screws**,** Hand drill and drill bit**,** Jeweller saw and Piercing Saw Blade**,** PVA glue**,** Painting brushes**,** Pair of compass**,** Pencil**,** Wood, Ruler**,**Sand paperand Screw driver.

3.1.1. Measurements of Stand of Instructional Resource *(sua ntεm)*
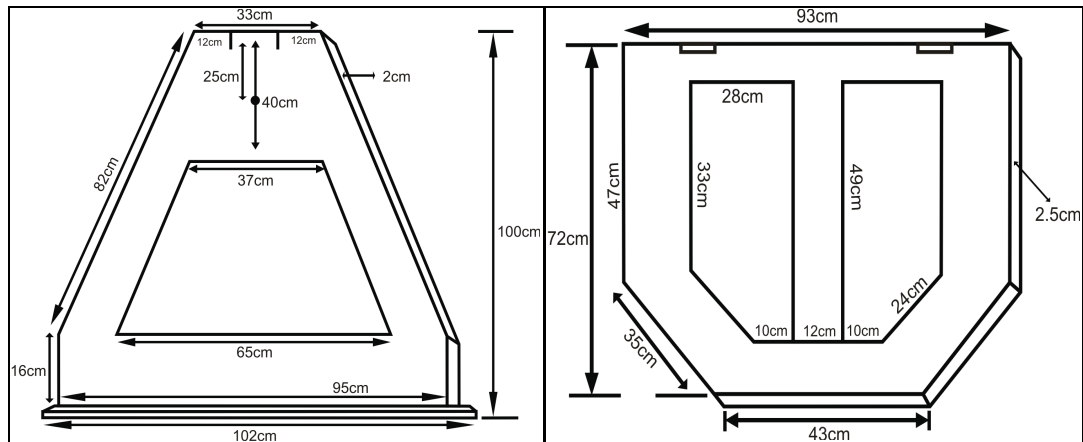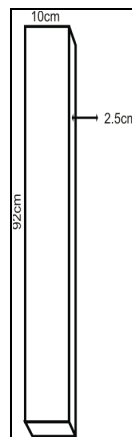

Figure 1: Stand of instructional resource

Figure 2: Vertical support of stand

Figures 1 and 2 are the measurements of stand of the instructional resource

3.1.2. Constructing the Stand for the Instructional Resource
The following procedures were employed in executing the stand for the IR.
1. Measurements of the top and bottom parts of the stand for the IR were drawn on the plywood board.
2. The outline of the marked lines was cut-out with the jig saw (Figure 3).
3. Surfaces and edges of the cut-out stands were smoothened with sandpaper. Strips of *'Afram'* wood were used to lip the edges to prevent it from flaking.
4. A vertical support on which the top part of the stand should lean was fixed with a hinge to make it movable (Figure 7).
5. A stopper was constructed at the base of the stand to prevent the vertical support from tripping (Figure 8).
6. On the top part of the stand, a hole was drilled and then inserted with a cylindrical metal tube to accommodate the bolt from the back to protrude at the front. The essence for this was to serve as a support to hang and rotate the colour wheel and its components (Figure 9).
7. The stand was then painted with emulsion and acrylic paints (Figure 10).
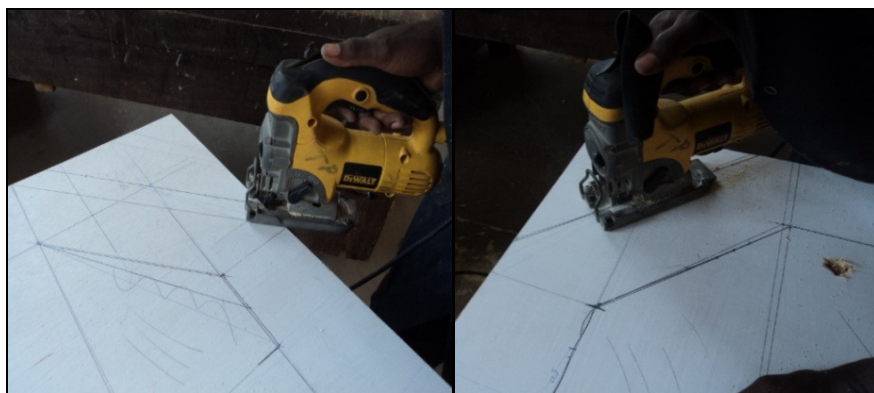
Figure 3: Cutting the stand with a jigsaw

Figure 4: The cut-out stand

Figure 5: Constructing a footing for the stand

Figure 6: The constructed footing at the base of the stand

Figure 7: Fixing the hinge on the vertical support and the top part of the stand

Figure 8: Nailing a stopper to the footing of the vertical support

Figure 9: A bolt inserted in the slot to make hang instructional resource

Figure 10: The stand for instructional resource

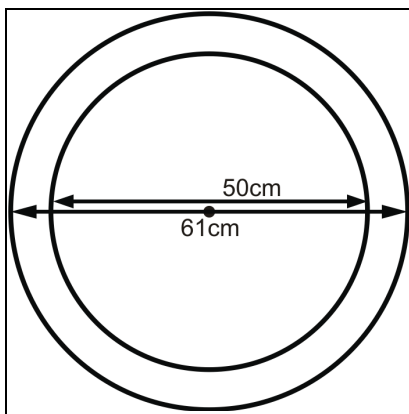3.1.3. Constructing the Instructional Resource
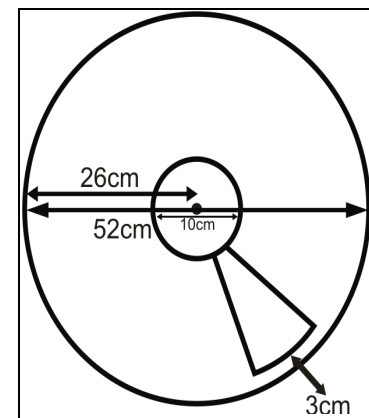

Figure 11: Measurements of colour wheel

Figure 12: Measurements of components

The following procedures were employed in executing the instructional resource based on the conventional colour wheel.

1) A circle of 61cm and 52cm as diameter for the instructional resource respectively were constructed on the half inch plywood board and cut-out.
2) On the plywood board for the colour wheel, a circle of 26cm was described and divided into 12 equal parts with a pair of compass and rule.
3) Portions of the rest of the wooden board were cut-out to reveal the underneath colour, for the complementary, split complementary, analogous, triads, tetrads colours (Figure 13).
4) Surfaces of the round shaped plywood board were smoothened with sand paper of different grades (Figure 14).
5) Centers of the round shaped plywood board were drilled (Figure 15).
6) A cylindrical plastic tube was inserted to fit tightly into the drilled hole. This was made to prevent the plywood to wear as it would hang and rotate on the metal bolt (Figure 16).
7) It was painted with emulsion paint and painted over with acrylic (Figures 17 and 18).

Figure 13: Cutting portions of components of colour wheel with jigsaw

Figure 14: Smoothening surface and edges of components of colour wheel with sandpaper

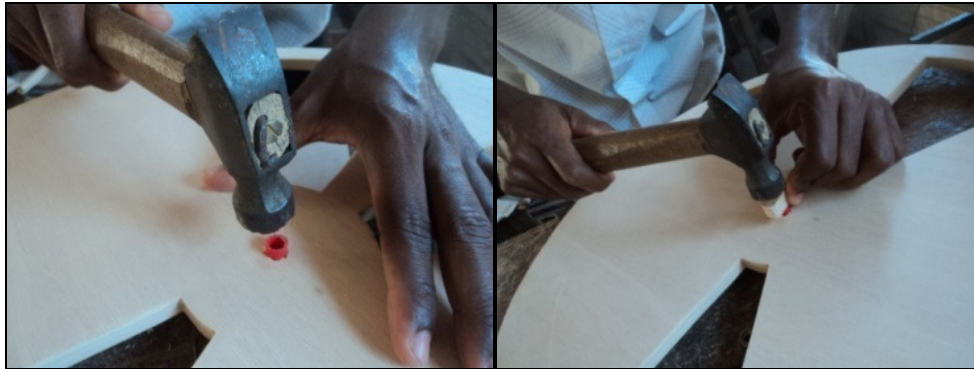*Figure 15: Drilling centre of components of colour wheel*

Figure 16: Knocking cylindrical plastic tube into colour wheel and components

Figure 17: Painting components of colour wheel with emulsion paint

Figure 18: Painting colour wheel with acrylic paint

Figure 19(a): Finished sample Colour wheel

Figure 19(b): Component colour for colour mixing

Figure 19(c): Component for colour tetrad

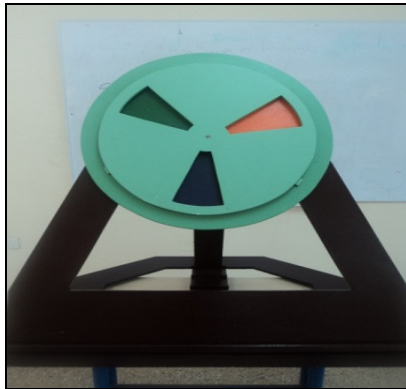*Figure 19(d): Component for split complementary colours*

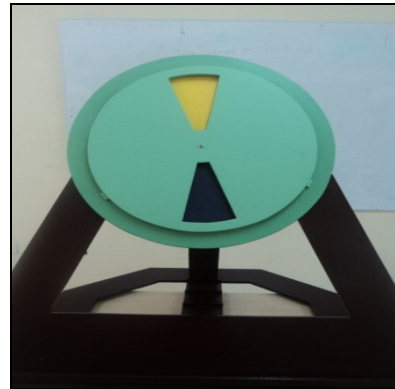*Figure 19(e): Component for colour triad*
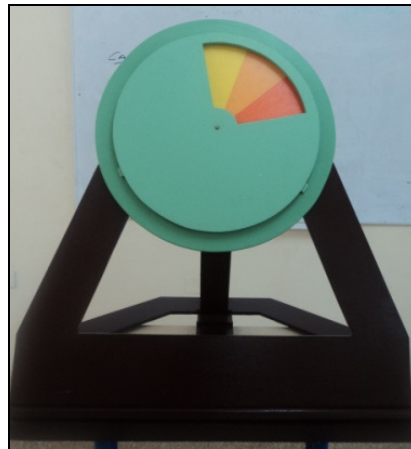

Figure 19(f): Component for complementary colour

Figure 19(g): Component for analogous colours

4. Using the Instructional Resource (*sua ntɛm*)

The instructional resource (IR) is a manually operated system. Its operational movement can be likened to the conventional wheel of fortune mechanism. The operator will have to manually spin the components attached to the main frame based on the colour concept being taught.

The wooden components of the wheel are attached to the main frame by the help a cylindrical plastic tube which helps the oscillating process of the board. The components of the wheel are designed specifically for the teaching of concepts like colour wheel, analogous colours, colour tetrads, complimentary colours, split complementary which are difficult to assimilate by abstract lecture method.

The height of the *sua ntɛm* allows it tobe operated in either sitting or standing position taking into cognisance the different age group that can use it. The height is 120cm and can be adjusted by giving it a plat form to increase height if preferred for a standing position or using a larger class size.

5. Test of Instructional Resource (IR)

In the testing of the resource the researchers used students who are exposed to the old methods of teaching colour concepts (lecture method, projector effect, chalkboard discussion and white board illustrations).

This population was adopted in order to examine the reaction of student to active learning capabilities of the new instructional resource. Again, to ascertain the performance level and acceptability of the IRthe testing was carried out with both a smaller class and a large class, eighteen (18) and sixty (60) respectively.

The components of the wheel are designed specifically for the teaching of concepts like colour wheel, analogous colours, colour tetrads, complementary colours, split complementary which are difficult to assimilate by abstract lecture method.

5.1. Acceptability

A Five (5) point Likert scale was administered to a heterogeneous group to ascertain the level of satisfaction and acceptability of the instructional resource.

First year Ceramics students -   7
First year Textiles students -   67
First year Painting students -   16
First year Graphic Design students -   281
First year Sculpture students –   8
Lecturers who teach Colour Psychology -   5
                                    Total = 384

The researchers adopted two approaches to test for the level of satisfaction and acceptability of the Instructional resource, one for the students and one for the lecturers.

5.1.1. Students Level of Satisfaction and Acceptability

Results from the level of satisfaction of performance of the Instructional resource as shown in percentages.

Very satisfied	Satisfied	Neutral	Not satisfied	Not Satisfied at all
93%	6.4%	0	0	0

Table 1: Rating scale results presented in percentages.

From Table 1, it can be noted that participants were positive and subscribed to the performance and acceptability of the (IR). Majority of the students representing 93% decisively affirmed their satisfaction of performance of the (IR).

5.1.2. Lecturers Level of Acceptability

Very satisfied	Satisfied	Neutral	Not satisfied	Not Satisfied at all
80%	20%	0	0	0

Table 2: Rating scale results presented in percentages

From Table 1, it can be noted that participants were positive and were in agreement to the performance and acceptability of the (IR). Majority of lectures engaged showed interest in the usage and performance of the (IR).

5.2. Conclusion

From the interaction with both lecturers and students during the test of the instructional resource findings revealed the usefulness of the tool. It was noted that an active learning environment was created during lecture periods where student could engage with physical and tangible objects for learning as opposed to earlier abstract lecture formats. The observations and finding from test dovetailed into the assertions made by Abu-Jaber as cited in Abdelraheem & Al-Rabane (2005), instructional media allow the growth of specific learning abilities and enhance intellectual and motor skills. The use of charts and models enables the teacher to present and illustrate many physical phenomena and issues easily and at the same time, allows them to focus attention on the characteristics of objects.

The instructional resource (IR) created a hands-on teaching environment where students could practise and experiment through experiential learning approach where opportunity to self-learning promoted students achievement relating to colour knowledge, concepts and application.

Results from test showed positive acclamation to the acceptability and performance of instructional resource.

6. References
i. Abdelraheem, A. Y. & Al-Rabane, A. H. (2005). Utilisation and Benefits of Instructional Media in Teaching Social Studies Courses as Perceived by   Omani Students. Malaysian Online Journal of Instructional Technology, 2 (1), 1.
ii. Adu-Akwaboa, S. (2010). Art for schools and colleges. Kumasi: Samarg Publication.
iii. Agbenatoe, W. G. (2011). Improving the quality of teaching and learning of General Knowledge in Art using the Multiple Intelligence Lesson plan. MA Thesis. KNUST. Kumasi.
iv. Campbell, J. (2012). Methods of teaching art: eHow.com. From http://www.ehow.com/list_7322662_methods-teaching-art.html. Accessed on 28th October, 2012.
v. Croft, D. J. (2000). An activities handbook for teachers of young children. Boston: Houghton Mifflin Company.

vi.   Descy, D. (1991). Instructional media utilization in the classroom and its relationship to teacher burnout and student learning. International Journal of Instructional Media, 18 (2), 99-106.

vii.   Ecker, C. I., Gelsinger, B. D., & Johnson, S. M. (2002).Selection, evaluation, and adoption of instructional materials. From

viii.   http://www.carrollk12.org/assets/File/LibraryMedia/instructionalmaterials.pdf.Accessedon 4th June, 2012

ix.   Farrant, J. S. (1996). Principlesand practice of education. New edition. Singapore: Longman.

x.   Kundu, C. & Tutoo, D. C. (2004). Educational psychology. New Delhi: Sterling.

xi.   Leclercq, D. & Poumay, M. (2005) The 8 Learning Events Model and its principles. From http://www.labset.net/media/prod/8LEM.pdf. Accessed 15thMay, 2011.

xii.   Mangal S. K. & Mangal, U. (2009), Essentials of Educational Technology. PHI Learning Private Limited, New Delhi. From: http://books.google.com.gh/books?id=fGykvf11JX4C&pg=PA134&lpg= PA134&dq Accessedon 18th August, 2011.

xiii.   Ocvirk,O. G., Stinson, R. E., Wigs, P. R., Bone, R. O., & Cayton, D. L. (1998). Art fundamentals. Theory and practice (8th Ed.). New York: McGraw-Hill.

xiv.   Ruis, N., Muhyidin, M & Waluyo, T. (2009). Instructional media. Center for Development and Empowerment of Teachers and Education Personnel. Jakarta: Ministry of National Education. From http://mmursyidpw. files. wordpress. com/2009/05/instructionalmedia.pdf. Accessedon 11th March, 2011.

xv.   Scanlan, C. L. (2003). University of Saskatchewan Teaching and Learning Centre. Using instructional media. From http://www.usask.ca/tlc/utl_using_it.html. Accessedon 10th January, 2012.

xvi.   Smith, P. & Blake, D. (2005). At a glance: Facilitating learning through effective teaching. National Centre for Vocational Education Research, Adelaide SA. From http://www.ncver.edu.au. Accessed on 10th November, 2011.

xvii.   White, C., Manfred, L., Bowen, J., Leamon, M., Koestler, J., Konopasek, L., Kimmelman, M., Krueger, P. M., Rogers, D. A., (2005). Instructional methods and strategies: guide book for clerkship directors (3rd Ed.). Gegensatz Press. From http://familymed. uthscsa.edu/ACE/ chapter5. htm.   Accessed on 5th August, 2011.

xviii. Willkinson, P. E., McNutt, M. A., & Friedman, E.S. (2003). Practical teaching methods K-6: Sparking the flame of learning. Thousand Oaks, CA: Corwin Press, Inc.