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# **Development of Varied Macramé Patterns Based on Successive**

# **Approximation Model to Facilitate Teaching and Learning**

Ibrahim H.F., Opoku-Asare N.A.A, Mate M.M & Asmah E.A (2020)

Article Info	Abstract			
Article History	The study sought to explore varied knotting techniques to develop different			
	macramé patterns for fashionable accessory with the objective to facilitate			
Received:	teaching and learning within the higher education Fashion Design and Textiles			
27 January 2020	programme in Kumasi Technical University. Based on the Successive			
Accepted:	Approximation Model (SAM), it examined and meticulously adopted a			
16 February 2020	teaching and learning approach on some selected fashionable macramé			
	accessory products. The methodology employed both the qualitative and			
Keywords	quantitative research methods to gather and analyse extensive primary data,			
Successive	using the exploratory project based and quasi experimental methods. Both the			
Approximation Model; Instructional design	convenience and purposive sampling techniques were employed to engage			
	124 male and female Fashion Design and Textiles students in this project-			
	based research. Interviews, questionnaire and observation methods were the			
model;	instruments used to gather data. The findings identified two knots (square and			
Macramé;	clove hitch knots) from the existing macramé knots as those that can be used			
Dattamat	for pattern development, and can serve as a guide when creating and			
Fatternis,	developing patterns to be used to produce accessories. The clove hitch knot,			
Development	manipulated was the basis of creating versatile, effective and reliable strong			
	and secure patterns. The conclusions made were that the square knot was			
	found suitable for starting, ending or closing patterns, which helped in			
	developing the accessories.			

## Introduction

Successive approximation model (SAM) is an active development model, which ensures learning, retention, and business (Allen, 2012). The model is clearly defined and manageable, and encourages creativity and experimentation. It consistently reveals the design as it evolves, and it does so in ways that all stakeholders can see and evaluate. It helps all team members to communicate with each other, contribute, and collaborate (Safari, 2018). SAM accepts design correction timely and regularly. It inspires creativity, and validates ideas early enough to make alterations if results are not satisfactorily. SAM is a process that helps an individual and also promotes group or teamwork by building real ideas. Successive approximation model has two types; SAM1 and SAM2. SAM1 is for smaller projects, which is simple, but nevertheless produces excellent products quickly while SAM 2 is for more complex projects. SAM produces an essential product after only a couple of quick iterations, which allows design modification early and frequently (Chatfield, Zidek and Lindsey, 2010).

The technique of macramé emphasizes on the knots used in creating the patterns where learners can acquire their own instructional experience. The SAM when used in creating patterns will provide a more detailed explanation on how the patterns were created by the technique of macramé. The involvement of the SAM model in creating patterns helps in improving on how to design with macramé knots to enhance learning. The framework seeks to define ways of creating the macramé patterns through a chronological manner in reference to the usefulness of the knots and how to create patterns using the SAM model with ease. On the part of the existing knot, the framework presumes that the square and clove hitch knots are the actual knots to use is in creating patterns due to its versatility and its ability to be iterated to suit any pattern that the researcher seeks to derive by adapting the successive approximation model.

#### **Review of Literature**

Instruction means teaching and learning of knowledge, skills and attitudes. Instruction is putting an effort to facilitate learning (Smaldino, Lowther, Russell, and Mims 2015, p. 25). Instructional system design (ISD) is 'the systematic development of instructions utilizing learning and theory of instruction to ensure effective instruction (Berger and Kam, 1996). It is the process of analysing the learning needs, goals and the development of a delivery system. It includes development of instructional design is concerned with understanding, improving and applying methods of instruction. It is a discipline of producing knowledge about diverse methods of instruction. The Association for Educational Communications and Technology (AECT) defines instructional design as "the theory and practice of design, development, utilization, management, and evaluation of processes and resources for learning" (Reiser, 2002, p. 1).

Instructional system design is to be able to create instructional experiences that facilitate the acquisition of knowledge in a way that is not only efficient, but also effective and appealing to learners. The focus of instructional design is on enhancing the learning acquisition process with the goal of engaging, encouraging, and motivating learners to gain deeper, more significant, and more meaningful levels of understanding and knowledge by serving as a framework for developing learning modules (Reigeluth and Carr-Chellman, 2009).

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#### **Instructional Design Models**

Several models of instructional design have been developed to suit various instructional purposes and by differing levels of expertise of instructional designers. Many instructional design models have been developed and used over the last few decades (Reigeluth et al, 2009). The models differ in terms of the number of steps, the names of the steps, and the recommended sequence of functions, which is needed to guide instructional program development (Sink, 2002 as cited in Biech). Gustafson and Branch's (1997) *Survey of Instructional Development Models* include 18 models. Some models of ISD are ADDIE Model, Substitution Augmentation Modification Redefinition (SAM R), Successive Approximation Model (SAM), Dick and Carey Model and Gagne Model. These models are guidelines that are used in the process of making a new "learning platform". These models give the opportunity to make informed decisions that answers questions such as what, when, how, and where, as far as the design and development of a learning platform is concerned (Yeboah, 2014). Some models have been explained as follows:

According to Essel (2012), ADDIE stands for Analysis, Design, Development, Implementation and Evaluation. It is an active and ever-changing guideline used for creating effective learning platforms. It is the five stages of this model that make up the whole instructional design process. This model starts with knowing learners' challenges, coming out with solutions to those problems and evaluating the solution to measure the effectiveness. This design model is illustrated in the section as shown in Figure 1.



Figure 1: The ADDIE Instructional System Design Model *Source: Morgan (2011)* 

According to Burgess (2013), the Dick and Carey Model is an orderly support that aids in delivering content of instruction. It is a means of arranging learning by taking the learner into consideration, including seeking feedbacks at various stages of the design to aid in effective teaching. This model consists of ten interconnected phases that depends on one another and gives results for each stage to achieve its goals successfully (Dick and Carey, 2005). This model trusts that learning is built when already known knowledge merges with new knowledge under suitable learning conditions. The Dick and Carey model "summarizes the fundamentals of

instructional design using concepts and procedures for analysing, designing, developing and evaluating instruction" (Dick, Carey & Carey, 2005). This design model is illustrated in the section as shown in Figure 2.



Fig. 2: The Dick and Carey Model of Instructional System Design *Source: Ballard Education, LLC (2009)* 

Successive approximation model (SAM) is an instructional design model, which serves as a means of creating more effective and efficient strategies to shape excellent teaching and training. With SAM, the aim is to take smaller, more flexible steps within a larger framework to achieve high quality training and learning in contrast to following the inflexible, step-by-step procedure of other instructional design methods (Instructional Design, 2014). Steen (2008) describes successive approximation as "an iterative approach whereby the designer repeatedly applies a three-step process of design, prototype, and review in a rapid but controlled process to produce quick but appropriate eLearning". SAM is an important process for the design and development of interactive learning events that are meaningful, memorable, and motivational. It is a fast, agile, and a collaborative model that many instructional designers use. It is an iterative model, which requires repeating a process or a stage, and continues to build upon each repetition (Allen Interaction, 2003).

From the definitions stated, it can be emphasized that SAM is useful for effective training options that can improve the learning or training experience especially in teams. It also makes room for assessing course, as it builds on learning allowing for ways to make changes when needed in order to create projects following the stages.

Successive Approximation Model (SAM) has three phases that are shown in figure 3 below:

- Evaluating phase
- Design Phase and
- Development Phase



Figure 3: Successive Approximation Model (SAM) Source: researchgate.com

Evaluation Phase: This stage quickly evaluates (analysis) the situation, need and goals by gathering information and brainstorming (Instructional design, 2014). It starts with a very quick preparation phase. Background information is gathered and immediately moves into a stage where an initial brainstorming is established for a successful project (Interactions, 2015).

Design Phase: This is where the collaboration sets in as a means to refine the prototype or a rough design until the researcher has determined that the design is in a good enough shape to be a proof of the concept and quickly, with thought, prepares a rough design for discussion (Chatfield, Zidek and Lindsey, 2010).

Developmental Phase: This is the stage where the researcher needs to work at developing the prototype design proof into an effective instructional model of a goal (Allen, 2012). Then comes further iterations by preparing prototypes using tools, which can quickly provide a sense of the design idea (Instructional Design, 2014).

### Comparison of ADDIE, SAM and Dick and Carey Models of Instructional design

While the SAM is known to work in a circular or cyclical manner, which allows for repetition, the Dick and Carey model is more appropriate for classroom orientation, which means that it leads to an output of one or a few hours of instruction because it follows strict steps. With the ADDIE model, which begins with the analysis phase and follows the steps strictly to the evaluation phase and makes the ADDIE and Dick and Carey models very rigid, the SAM allows for learning and changes (Yeboah, 2014). The ADDIE, Dick and Carey, and Successive Approximation Model (SAM) models of Instructional Systems Design therefore suggest that to design and develop an effective learning platform, there is the need to follow some procedures that have been tried and tested in order to produce results. The Successive Approximation Model (SAM) of Instructional Systems Design is most appropriate to apply based on the fact that it gives room for repetition and an intervention for creating the patterns. The SAM model is clearly outlined and adaptable, which also incites creativeness and innovation. It consistently shows the design as it develops in ways that all team members can

perceive and assess. It also helps to increase communication, contribution, and collaboration among team members (Chatfield, et al., 2010).

The successive approximation model (SAM) when used to develop courses for instruction has the ability to foster creativity and at the same time reach goals by adding on to existing knowledge (Safari, 2018). SAM provides learner activity, response, scenario-based learning experiences and correct delivery approach (Brown and Voltz, 2005). Instructional system design has a component of art, which relies on the techniques, use of knots and an understanding of the knowledge and skills to be delivered (Steen, 2008). In relation to this study, the SAM was adopted and used as the instructional model for creating macramé patterns.

#### Conceptual framework

The technique of macramé emphasizes on the knots used in creating the patterns where learners can acquire their own instructional experience. The SAM when used in creating patterns will provide a more detailed explanation on how the patterns were created by the technique of macramé. The involvement of the SAM model in creating patterns helps in improving on how to design with macramé knots to enhance learning. The framework seeks to define ways of creating the macramé patterns through a chronological manner in reference to the usefulness of the knots and how to create patterns using the SAM model with ease. On the part of the existing knot, the framework presumes that the square and clove hitch knots are the actual knots to use is in creating patterns due to its versatility and its ability to be iterated to suit any pattern that the researcher seeks to derive by adapting the successive approximation model as shown in Figure 4 below.



Figure 4: Developed by researcher

#### Methods

In this section research design, participants' information and research process are detailed.

### **Research Design**

The study adopted the qualitative design which involved the exploratory research which was used in determining the research design, sampling methodology and data collection method (Research methodology, 2018). Exploratory research was done in order to ascertain the kind of problem, which helped the researcher to comprehend the problem (using the right instructional system design for creating the patterns) which helped in discovering ideas and insight as a result of knowledge and understanding of the instructional system design.

#### **Participants**

The participants of the study consisted of, first, second- and third-year Ordinary Diploma and Higher National Diploma (HND) students at the department of Fashion design and Textiles in Kumasi Technical University at the time of the research as shown in Table 1. HND students was made up of 124 third year out of the total population of 582 Fashion design and Textiles students. These students were selected based on their availability to the researcher. The total number of students in the class (third year HND students) was 124, who were grouped into 11 (consisting of 9 females and 2 males) and a leader.

YEAR	DIPLOMA STUDENTS	HND STUDENTS		
First	66	101		
Second	93	97		
Third	101	124		
TOTAL	260	322		

Table 1: Target population, 2017.

#### **Research process**

In line with which knot can be used to create the patterns, an instructional model was used to carry out in order to provide steps on how to develop the patterns. The core of this research is centred on the SAM (successive approximation model), which was used in the development of macramé patterns. Successive approximation is a term adapted for use in an instructional design context (Allen, 2012). SAM is a process that Allen applied to instructional design models as a means of creating more effective and efficient ways to build quality training and instructional tools. The repetitive nature of the SAM made it feasible to use it in executing the macramé patterns. This also helped the researcher to introduce the model to the students since they had no idea about how the model can be adapted for creating macramé patterns. With SAM, the goal is to take smaller, more flexible steps within a larger framework to achieve high quality training and learning. The SAM design was adapted in consideration for helping future researchers know how to develop patterns using this instructional model illustrated in Figure 5.



Figure 5: Researchers' Construct

SAM model is in three stages, which are

- Analysis / Evaluation
- Design the model
- Develop the model in an iterative manner

## Phase One: Analysing/ Evaluation

An analysis of the nature and characteristics of two knots (square and clove hitch knots) was done, in addition to the type of material to use and the kind of patterns to create in phase two of the SAM model. The square knot is known for being strong, compact and good for joining and as a stopper. The clove hitch is known to be much stronger than the square knot, it has a backing knot that makes it secure, and also knots exceptionally well. Rayon was chosen as the material used in the knotting process. It is a combination of cotton and nylon which does not frail or slip when knotted. The rayon cords are very firm because they incorporate wool in the middle, which can be pulled out when making artefacts that should be light in weight (Mate, 2009).

The patterns that were created for the project were based on existing African and European designs and symbols. The square knot was used to produce the accessories since it has the ability to join, start or end while the clove hitch was chosen for creating the patterns. The decision on creating the patterns and producing the accessories was made at this stage.

#### Phase Two: Design the Patterns

After getting to know the knots to use in creating the patterns, the initial designs were made with CorelDraw. The designs were made in a way that would help to achieve a recognizable African or European symbolic pattern. The designs that were created evolved into the various patterns shown in Figures I to IV. The repetitive nature of the SAM made it feasible to use it in executing the macramé patterns. This also helped the researcher to introduce the model to the students since they had no idea about how the model can be adapted for creating macramé patterns. With SAM, the goal is to take smaller, more flexible steps within a larger framework to

achieve high quality training and learning. The SAM design was adapted in consideration for helping future researchers know how to develop patterns using this instructional model illustrated in Figure I to IV.





Phase Three: Developing the Patterns

With the help of the CorelDraw software, a model was developed as to how the patterns can be achieved by knotting. That was done through the movement and flow of the knots to achieve the patterns and how the patterns can be derived from the knots. This was worked and developed in a repetitive manner while making sure the pattern evolves accurately by adjusting the knots. Where it turned out inaccurate, the step was repeated until a pattern evolved which the cyclical and iterative SAM allows for a process or stage to be repeated in a successive manner until the desired pattern has been achieved (Allen, 2003).

A knot guide was first developed as a foundation for getting the patterns right and accurate. This involved developing a way of tying by reversing the usual way of creating the knots in order to get the desired patterns.

The changes made in knotting was introduced in four ways: backward knot – BK; forward knot- FK; forward then backward motion – FB; and backward and forward motion - BF as shown in Figures I to IV.

Knot Guide

• Backward Knot (BK)



• Forward Knot (FK)



Forward, Backward (FB)



• Backward Forward (BF)



# **Data Analysis**

Analysis largely depended on statistical measures of frequency and percentage to assess the knowledge of students about macramé. Most of the quantitative data collected from students were measured in respect of the demographic variables of gender, age and levels of study. From the practical observation that took place in the classroom, the researcher found that the use of beads was an instruction given to them which explained the students' reaction towards the technique they said they use for their practical works and stated in the Table below. Though Accessories as a course includes beading, knitting, crocheting and macramé, beading was the technique mostly used by the students for their practical works, showing 46% of the students, implying that a large majority of the students seemed to be more interested in beading even though that is not the only existing technique. Most of the reasons were because beading technique had been introduced to them so they found it more appropriate to use that for their practical works. Moreover, beads are widely available in Ghana and are mostly used in our cultural aspects of life and are readily available in the market, which makes it easy for students to get access to.

Technique	Frequency	Percentage	
Beading	100	46.0	
Macramé	41	18.9	
Knitting	12	5.5	<b>D</b> . J
Crocheting	55	25.3	

Table 1: Response on the Technique Used for Practical Work

## **Results and Discussion**

Designing the knot guide created the movement of the knots to be seen as reflecting the shape of the pattern of knots were expected to create. The clove hitch knot is the most versatile of all the macramé knots, and there are endless possible patterns and variations that one can derive from this knot (Mate, 2009). Most macramé designs use this knot in one form or another to form patterns. The SAM instructional design model facilitated the creation of patterns with the clove hitch knots due to their versatility of use and iterative nature of the model. The adoption of the SAM as a guide to create patterns in macramé presented some challenges with the knotting techniques mainly because the directions of the knots were mostly modified to achieve the desired patterns. This required the use of different techniques of knotting. For example, knotting the clove hitch moves from right to left to create patterns that moves in a linear direction. Making of the circular Star pattern in particular brought about some difficulties with the linear clove hitch that moves in a forward direction. Changing the movement of the clove hitch knots to form a circular pattern was not achieved since it can only be used for creating patterns in a linear direction. The SAM model was applied to modify the order of knotting the clove hitch to develop a new technique that caused the knots to move in both linear and circular manner. This resulted in four techniques,

Source: Field Work 2018

which are the forward knot, backward knot, forward-and-backward knot and backward-and-forward knot. These techniques were made possible by applying the different stages of the SAM, which allows for repetition and trails to get the patterns to move in a circular manner for creating the Star pattern that was subsequently used to create other patterns for the study as illustrated in figure 1.



The technique of macramé by adapting an instructional model such as SAM which gives a direction on how to develop patterns and help students to easily create patterns. The model gives room for repetition until the patterns are derived. SAM is a cycle, which helps in creating teamwork and collaboration. It also serves as an interesting model, which guides students in making the technique of macramé an interesting skill.

SAM makes teaching and learning more meaningful and helpful to students since it creates new knowledge of the skills they have acquired on their own. This is necessary since it enhances the learner's ability to create, build and design more patterns. During the practical session the ability of the students to grasp certain patterns was difficult since it involved the use of the left hand, but through repetition and constant practice, the difficulty was no more.

Using an instructional system design to teach accessory making was of great help for the research as it served as a guide in creating the patterns. This research found out that the technique of macramé is unlimited in its capabilities and can be manipulated in any form with the help of knots to produce different patterns, which can be used to create any form of artefacts since the resources and tools for macramé are easily accessible and inexpensive.

# Conclusion

The macramé patterns that were used to produce fashion accessories were creating using practical means based on adaptation of the successive approximation model (SAM). It was observed during the research that the production of the accessories with the patterns needed some additional knotting which brought in the Chinese knots to complete the accessories based on the SAM model as a guide.

Again, the clove hitch knot that was the basis of creating the patterns had to be manipulated by tying in other ways with the help and guide of the SAM model. It was realized that they could be mounted horizontally, vertically, and diagonally and even be knotted from the middle depending on the type of pattern to be achieved. It has proven to be very versatile, effective and reliable in developing strong and secure patterns.

It was concluded that the clove hitch knot could be used in developing a lot of patterns in macramé. It was discovered that instructional design models so not only have apply to eLearning systems but also can be incorporated into art and design projects to achieve results. This was achieved by designing a knot guide that helped guide the researcher in achieving those patterns. The patterns created were also designed to depict the meanings from existing African and European symbols. For example, the African symbols like the Adinkra symbol, which signifies hypocrisy was achieved through the development of macramé patterns. Other designs the chess pattern, which is popularly used for playing games, as well as the star, and kite patterns which were derived from the shape, were thus achieved using the SAM model.

# Recommendations

Users of this project report should follow the step-by-step procedure and illustrated demonstration to produce similar projects and also develop their own patterns by adapting instructional system designs and models.

Fashion design and textile lecturers can teach macramé techniques for accessory making and also learn to use SAM to design more flexible course materials to guide the teaching and learning of art and design courses for both regular and e-learning modes to expand access to vocational skills development through higher education.

Macramé is part of the fabric construction techniques, which are studied in various educational institutions. Therefore, the attention of teachers and institutional heads must be drawn to favour the teaching, learning and application of macramé techniques.

Other basic macramé knots can be used for knotting patterns or can be explored in the production of other items to expand their scope. The study employed the square knot and clove hitch knot techniques of macramé but advance research can be done using other basic knots to create unique patterns and designs. Further research must be carried out on how to develop more patterns from other basic knots in order to bring out and create new patterns.

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