

# Teachers' Attitude Towards Cooperative Learning Method and Pre-School Children's Competences Acquisition in Mathematical Concepts in Kirinyaga County, Kenya

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## Abstract

This research sought to establish the effect of the teacher's attitude towards cooperative learning method (CLM) on the development of pre-schoolers' competences acquisition in mathematical concepts. (CLM) is a teaching method in which small groups of learners with varying degrees of ability work collaboratively on carefully devised tasks using a range of learning activities designed to ensure knowledge construction and competence. A sample of 20 pre-schools out of the 197 public pre-schools in Kirinyaga County, Kenya, was applied in the study. The purpose of this study was to establish the difference between the mean score index of pre-school learners taught by teachers with favourable and unfavourable attitude towards CLM. Observation schedule and teacher questionnaire were employed in gathering the essential data. The researcher observed each of the twenty pre-school teachers facilitating 639 pre-primary two classes in the mathematical concepts' in the real-learning mathematical activity lessons. The various levels of the teachers' attitude towards CLM were tied to the pre-school learners' performance in the mathematical concepts competences. This performance was derived from the results realized from mathematical concepts competences achievement test issued to the learners. A documentary analysis guide was used to access the pre-school teachers' professional documents to establish their level of documentation in line with CLM. Correlational and comparative research designs were applied in the study to enable the researcher to establish the contribution of the teacher's attitude towards CLM on the pre-school learners' mathematical concepts competences acquisition (MCCA). The qualitative data collected was thematically analysed on the basis of the study objective and presented in narrative form. The quantitative data was descriptively analysed by the use of frequencies, percentages, mean and standard deviation. Inferential statistics was also applied in the analysis of the data collected. The focused aspects of the teacher's attitude were; teacher documentation, participation behaviour in the learning process, supporting learners with learning provisions, engagement behaviour in CLM activities and monitoring behaviour of the learning process. The study found that there is a positive relationship between teachers' attitude towards CLM and pre-school learners' mathematical concepts competences acquisition (MCCA). There was an improved accomplishment among preschool learners who were taught by teachers who were favourable towards CLM than those who were taught by teachers who were unfavourable towards CLM. This finding implies that teacher attitude towards facilitating mathematical concepts competences using CLM should be cultivated in pre-school teachers in order to enhance the mathematical concepts competences acquisition of pre-school learners in Kenya. The study did the recommendation that; due to the fact that the Competency Based Curriculum (CBC) does not include all there is in CLM, teachers need to be thoroughly oriented on the expected way of comprehensively incorporating the various elements of CLM for their appropriate professional practice in their mathematical concepts lesson delivery. It is only at such a point that they can blend the CLM aspects into the implementation of their lessons.

**Keywords:** Teacher Attitude; Cooperative Learning Method; Pre-school Children

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## 1.0 Introduction

Pre-school teachers undertake an essential role in ensuring the country's development through the teaching of mathematical concepts, by providing pre-schoolers with solid foundations in early mathematical literacy, which is fundamental for educational attainment and everyday living, and ensuring that their learners obtain good grades in assessments. This can only be achieved by adopting teaching methods that avoid the mundane and boring and improve pre-school learners' competences in mathematical concepts.

Traditional teaching methods emphasise the manipulation of expressions and algorithms as an essential base for solving mathematical problems. Teachers in their role of facilitators of learning habitually ignore the fact that understanding normally arises as a result of engaging in problem solving. Instead they may often spend the greater part of their time in lessons lecturing, demonstrating, offering examples and talking, rather than giving their learners sufficient time to practise mathematical problem solving on their own.

A number of studies examine the methods that are most suitable for teaching mathematical concepts (Ajaja, 2010; Aziz and Coop Hossain, 2010; Johnson and Johnson, 2010). Lafi (2001) identifies the importance of replacing the expository approach with a paedo-centric one, in order to actively involve learners in the

construction of their own knowledge. Uwezo (2010) also recommends that teachers should adopt teaching methods which are learner-centred. Gubbad (2010) asserts that pre-school learners ought to feel responsible for their own and their group's efforts, by encouraging and supporting one another.

In many countries in Sub-Saharan Africa, pre-schools teachers adopt a multiplicity of methods for teaching mathematical concepts, including the Cooperative Learning Method (CLM). The latter has been proved to be an effective instructional method that increases learner achievement due to increased strong motivation, greater time on task and active learner involvement. These findings require teachers to adopt instructional strategies and methods to improve the academic achievement of pre-school learners, particularly in mathematical activities.

Johnson, Johnson and Stanne (2000) redefined five key elements for effective CLM (small-group learning) as: positive interdependence, face-to-face interaction, individual and group accountability, group behaviours and group processing. When undertaken according to these criteria, CLM is capable of producing enhanced effort and accomplishment, better behaviour and turnout, increased self-confidence and feelings of dependability, which in return have a significant influence on knowledge acquisition.

Nawaz et al. (2014) cite Iqbar 2004, who studied the effects of cooperative learning on the academic achievement of secondary school students in Mathematics and concluded that cooperative learning is a far better teaching method for Mathematics and sciences compared to traditional methods. They conclude that teachers of Mathematics should be encouraged to incorporate CLM in their lessons; nevertheless, they emphasise that staff training for this should be carried out as a matter of course in order to ensure that this is achieved successfully (Nawaz et al., 2014).

Despite these assertions of its benefits, introducing CLM into classrooms has been a difficult task in many areas of Kenya due to inadequate teacher training, experience and exposure in using CLM for teaching mathematical concepts. Efforts, including teacher inductions through a series of workshops on the use of learner-centred learning methods under the umbrella of the TUSOME programme in order to alleviate these challenges, have borne little fruit and have so far been unsuccessful in improving learner levels of achievement.

Nevertheless, overall findings appear to indicate that pre-school teachers should adopt CLM as a mitigant to low grades in the acquisition of mathematical concepts. Urgent action is required to address the issue of extremely low levels of achievement in mathematical concepts, and to avoid negative repercussions in other curriculum areas which require a sound understanding and ability in them, in order to prevent high rates of school dropout as a result of learner frustration due to their academic performance.

Teachers' attitude is a significant factor in adopting any method of teaching in Mathematics classes. According to Abrami, Poulsen and Chambers (2014), teacher attitude is generally considered to be relatively positive. Furthermore, a positive attitude towards mathematical activities mirrors a positive emotional outlook with respect to the activity area and, equally, a negative attitude towards mathematical concepts competences corresponds to a pessimistic emotional disposition (Abrami et al., 2014).

Various studies have demonstrated that effective use of CLM is dependent on teachers' intentions, personal beliefs and attitude to teaching and learning for MCCA (Broussard and Garrison, 2011). A study conducted in Egypt by Cavas, Cavas, Karaoglan and Kisla (2010) established that learners whose teachers have a positive attitude towards any teaching method, such as the use of CLM, perform well in basic numeracy skills. In a study of 11 teachers in Indonesia, Farrow (2012) identified that among the factors that influence successful adoption of CLM in teaching basic arithmetic skills is the teacher's attitude and beliefs. In other words, if the teacher's attitude is positive towards employing CLM, then they are more likely to adopt it for teaching their learners.

Thanh (2011) conducted a similar study on teacher attitude to the use of CLM in Vietnam, using a questionnaire to collect data from 79 teachers in different elementary schools. The study revealed that although barriers existed, such as lack of certain resources, teachers' positive attitude towards CLM was an important determinant in the successful adoption of CLM in teaching mathematical activities, syllabus coverage and pre-school learners' enhanced academic achievement in mathematical activities.

On the other hand, a study by Ogbonnaya (2007) of 75 teachers in Lesotho identified that their reluctance to embrace CLM may have been due to the lack of time to learn about peer-mediated approaches, because of the challenge perceived that it might pose to their control of the learning process, the demands it places on classroom organisational changes or the professional commitments required to sustain their efforts. According to Gillies and Boyle (2010), if pre-school teachers perceive that CLM does not meet their needs or those of their learners, it is possible that they will not adopt the method for instructing mathematical concepts.

In many countries in Sub-Saharan Africa, research has shown that the attitude that pre-school teachers have towards CLM influences their acceptance of the usefulness of CLM in the teaching of mathematical activities in pre-schools (Worth, 2010). In a similar study conducted in Tanzania, Broussard and Garrison (2011) established that the more experience that teachers have with teaching methods such as CLM, the more likely that they are to exhibit a positive attitude towards it. More specifically, these findings show that a positive attitude on the part of teachers fosters their use of CLM in the teaching of mathematical activities in pre-schools.

The scenario is much the same in Kenya, with studies indicating that teacher attitude to CLM and other

hands-on learning methods greatly influences whether or not a pre-school teacher will use any of these methods for the teaching and learning of mathematical concepts. Research by Muriithi (2013) and Kamau (2015) identified that a considerable number of teachers have a negative attitude towards hands-on teaching methods, such as CLM, as a strategy for enhancing subject competency in their learners. Among the reasons identified for avoidance of these teaching methods were anxiety, self-efficacy, dislike, perceived lack of usefulness, as well as teachers' lack of enthusiasm or confidence.

Abdulwahab et al. (2016) recommend that if pre-school teachers start with periodic lessons or units that use CLM and then begin to incorporate CLM progressively into their teaching delivery, the teachers are more likely to develop a positive attitude to CLM as a method of instruction.

The indication from the above findings is that where pre-school teachers have a learner-oriented pedagogical approach, a positive attitude towards CLM, combined with exposure to and familiarity with CLM, in addition to their own professional development, these will all have a direct positive influence on the innovative use of CLM by teachers. Nevertheless, none of the empirical studies reviewed have examined how a favourable or unfavourable attitude on the part of teachers to the components of CLM may affect MCCA in pre-school learners.

## 2.0 Research Methodology

The research study applied correlational and comparative research designs, utilizing both qualitative and quantitative approaches; that enabled the determination of the existing differences in the acquisition of mathematical concepts competences among pre-school learners taught by teachers with favourable and unfavourable attitudes towards CLM. The sampling unit was pre-school. Twenty pre-schools and their (twenty) pre-school teachers, and 639 pre-school learners were involved in the study. The total pre-school population in the county was one hundred and ninety seven. The study took place in one school-term in 2019.

The research tools engaged collecting data for the research study comprised of a Document Analysis Guide, an Observation Schedule, a Questionnaire for pre-school teachers and a Mathematical Concepts Competences Achievement Test (MCCAT) for the learners. The researcher developed these research instruments specifically for the purpose after taking into consideration other globally-recognised related tools and adopting pertinent key components.

Live lessons were observed using agreed viz a viz the elements of CLM (Johnson, D. W., & Johnson, R. T., 2009). It is during the observation sessions that the researcher determined the extent to which pre-school teachers suitably implemented the activities identified for executing CLM in the learning session. The focus was on adherence to the elements of CLM that include; teacher documentation, participation behaviour in the learning process, supporting learners with learning provisions, engagement behaviour in CLM activities and monitoring behaviour of the learning process. Each of the teacher's documents were analysed using a documentary analysis guide to determine the adherence to the aspects of CLM as proposed by Johnson, D. W., & Johnson, R. T. (2009). Data from the documentary analysis guide was analysed where the researcher calculated the weighted frequencies of the teacher's documentation. Teacher's questionnaire contained statements about teachers' beliefs or their values regarding various aspects of CLM. It took a form of a Likert questionnaire, formatted in a self-report version to form a Standard Attitude Test. A mathematical concepts competences achievement test was meant to measure how well the teacher met learning achievement expectations in ensuring the acquisition of mathematical concepts on the part of their learners on a range of topics in five areas of mathematical concepts: Number Recognition, Number Patterns, Number Values, Addition and Subtraction Operations.

In order to determine teachers who were favourable or unfavourable to CLM, the researcher computed all question items or statements that sought to establish the extent of the difference between the mean score index of learners taught by teachers with favourable and unfavourable attitude towards CLM. The total aggregate points of question items or statements about teacher attitude to CLM were between 54.00 and 94.00. The 75<sup>th</sup> percentile was at 74.00 points, which the researcher established as the cut-off point. This implied that those learners whose teachers were above the 74.00 point were categorised as having been taught by teachers with a positive (favourable) attitude to CLM, whereas those learners whose teachers had aggregate points below the cut-off point were deemed to have been taught by teachers who were negative (unfavourable) towards CLM.

Cross tabulations, descriptive statistics and inferential statistics were employed to compare the mean score indices across the two categories of learners. The MCCAT determined the pre-school learners' level of attainment in mathematical concepts competences. Each of the 639 pre-school learner's MCCAT script was marked and calculation of their mean score done. The learner formed the unit of analysis.

The Kenya's Competence-Based Curriculum (CBC) rubric was used to qualitatively grade the learners' achievement: Below Expectation, Approaching Expectation, Meeting Expectation and Exceeding Expectation. Numerals were assigned to the qualitative grades to quantify them for data analysis as follows;

- A score of 3-4: Exceeding Expectation,
- Scores of 2-3: Meeting Expectation and

A score of 1-2: Approaching Expectation,  
 A score of 0-1: Below Expectation.

### 3.0 Teacher Attitude to CLM and Learners' MCCA

#### 3.1 Extent of Teacher Documentation and Learners' MCCA

Adequate planning and organisation is critical in ensuring the role of the teacher is successful in carrying out cooperative learning instruction (Gocer, 2010). The adequacy of teaching documentation in accordance with CLM, i.e. the preparation of a scheme of work (SoW) and a lesson plan (LP), was determined by examining the level of each teacher's compliance in articulating the elements of the five aspects of CLM: interdependence, face-to-face interaction, individual and group accountability, group behaviours, and group processing.

Interdependence expresses the concept that learners will work together to overcome challenges and complete the lesson activities successfully. This is referred to as positive interdependence. Face-to-face interaction refers to the way in which teachers present the collaborative learning tasks that they want the learners to participate in and carry out during the learning session. The individual and group accountability aspect requires the teacher to strategize how each learning group as well as all the individual members of the group will master the learning content material. Group behaviours are a component of CLM, where the teacher makes use of collaborative social skills needed for successful group work. Finally, group processing requires the teacher to indicate how they will monitor learners' behaviour, as well as the other tasks, such as giving feedback to learners, and learners' discussion of their group activities.

Adapting these CLM concepts in the teacher's professional documents accounted for one point (20%). Therefore, inclusion of all the five aspects of CLM amounted to 100% (5 × 20). This rating system is what determined teacher's level of preparation and documentation in accordance with CLM. The data was collected using the observation schedule and the documentary analysis guide. The analysed results are presented in Table 1.

**Table1: Teacher's Level of Documentation and Learners' MCCA**

Status	No of Teachers	Pre-school learners' MCCA				Status %
		Below Expectation	Approaching Expectation	Meeting Expectation	Exceeding Expectation	
	N=20	n=7	n=73	n=217	n=342	N=639
Teacher documentation in accordance with CLM – a) scheme of work						
N/A	10%	1%	10%	32%	57%	57%
40%<	15%	0%	0%	0%	0%	0%
40%-80%	35%	0%	10%	25%	55%	8%
>80%	40%	0%	6%	31%	63%	35%
Teacher documentation in accordance with CLM – b) lesson plans						
N/A	55%	2%	12%	37%	49%	52%
40%-80%	5%	0%	0%	30%	70%	6%
>80%	40%	0%	6%	20%	73%	43%

The adequacy of pre-school teachers' documentation in line with CLM is laid out in Table 1. It is evident that the majority of learners were taught by teachers who had no scheme of work (57%) and no lesson plan (52%) while carrying out learning activities. Teachers who had done schemes of work had organised them in groups or in pairs, where learners were expected to carry out learning tasks.

A group of teachers considered the CBC document to be a ready to use scheme of work which did not require any further additions. Some teachers delivered mathematical concepts competences lessons that were not in their actual scheme of work. When the researcher asked some teachers about it, one commented:

*'The CBC document is organised in such a way that one doesn't need to do a scheme of work. It is very easy to follow when teaching, unlike the ECDE Syllabus (2008) document. The number of lessons to be taught in every strand and sub-strand is very clearly stated and tabled, as well as their corresponding learning outcomes. It offers a very easy way to approach teaching to a teacher.'*

Another teacher said:

*'With the CBC document a teacher doesn't even need to do a lesson plan, let alone the scheme of work. If anything, if a teacher follows it to the letter it would lag learners behind because its content is very much simplified. Imagine a PP2 learner, for example, should not be exposed to solving mathematical concepts' problems exceeding digit nine!'*

Nevertheless, teachers must spend sufficient time to prepare and document the lesson for cooperative learning in order to ensure that it responds to their learners' needs (Gillies and Boyle, 2011).

Less than half of the learners (35%) and (43%) were taught by teachers who did their preparation of scheme of work and lesson plan at 80% and above respectively. From the data, learners taught by teachers who had adequate documentation (above 80%) in both scheme of work and lesson plan had 63% and 73% of their

learners exceeding expectation respectively. This was the highest majority of achievement of the statuses represented. This implies that the lesson plan was found to be a relatively more effective tool while teaching mathematical concepts competences in accordance with CLM. In his longitudinal study done in New York, Kane et al., (2006) indicated that a teacher who is prepared with a lesson plan and have a full mastery of a teaching method is competent in their delivery has the greatest impact on learner's achievement.

### 3.2 Teacher Participation Behaviour in the Learning Process and Learners' MCCA

Enhanced academic results are always realised in pre-schools where teachers have the requisite subject knowledge and teach the learners by participating in classroom management activities as they apply instructional methodology (Awiti, 2006).

Teacher's participation behaviour in the learners' learning process was evaluated in various aspects relating to: giving direction to group work, encouraging everyone to participate in the group work, expressions of support and acceptance of the learners, offering to explain and clarify ideas to learners and energising each of the learning groups to work.

The data collected was analysed and presented in Table 2.

**Table 2: Teacher Participation Behaviour in the Learning Process and Learners' MCCA**

Status	No of teachers	Pre-school learners' MCCA				Status %
		Below Expectation	Approaching Expectation	Meeting Expectation	Exceeding Expectation	
	N=20	n=7	n=73	n=217	n=342	N=639
Teachers giving direction to group work						
Done	85%	1%	2%	24%	73%	92%
Not done	15%	0%	8%	33%	59%	8%
Teachers encouraging everyone to participate in group work						
Done	100%	1%	11%	34%	54%	100%
Not done	0%	0%	0%	0%	0%	0%
Teachers expressing support and acceptance of learners						
Done	100%	1%	11%	34%	54%	100%
Not done	0%	0%	0%	0%	0%	0%
Teachers offering to explain and clarify ideas to learners						
Done	100%	1%	4%	22%	74%	15%
Not done	0%	0%	13%	36%	50%	85%
Teachers energising the group to work						
Done	100%	1%	11%	34%	54%	100%
Not done	0%	0%	0%	0%	0%	0%

The data presented in Table 2 about teachers' participation behaviour in CLM activities shows that the majority of learners had teachers who carried out most of the CLM activities. This is the essence of every effective learning facilitator to ensure that learners have all the requisite underpinning knowledge and resources in order to be able to carry out activities successfully (Gillies and Haynes, 2011; Jalilifar, 2010).

Learners who were given direction to group work by teachers had the highest percentage (92%) compared to those who were not directed (8%). Every teacher (100%) encouraged every learner to participate, expressed support and acceptance of learners in their CLM group work and energised the learning groups to work. Where these are observed, it stands out as the main feature of the CLM that distinguishes it from other instructional methods by giving the opportunity for interaction between learners (Mercendetti, 2010). This enables cooperative learning groups to realise their learning objectives guided by their small group activities.

Table 2 illustrates that there was a considerable disparity between learners whose teachers offered to explain and clarify ideas and those who did not: 15% and 85% respectively. Learners whose teachers gave direction to CLM group work, encouraged everyone to participate in CLM group work, expressed support and acceptance of learners, explained and clarified ideas to learners and energised groups to work were 92%, 100%, 100% (n=639), 85% and 100% consecutively. Every teacher (100%) indicated that they gave results to individual learners.

It is very noticeable that the learners' mean score indices progressed in all instances from the lowest score to the highest (below expectation 1%; approaching expectation 11%, meeting expectation 34%; and exceeding expectation 54%). The majority of the learners' MCCA exceeded expectation in the various CLM activities: 73% for learners who were given direction for their group work, 54% for learners who were encouraged to participate in group work, 54% for those who were given support and acceptance, 74% for those who were offered explanation and clarity of ideas and 54% for those who were energised to work in groups consecutively.

The impact of such levels of performance is worth noting, especially as it reflects the findings of other studies; for example, learners' in-class participation has been found to increase following the introduction of



cooperative learning in tutorials. This confirms Herrmann's (2013) findings in his study on the impact of cooperative learning on learner engagement in Aarhus University, Denmark that the CLM technique results in more in-class participation from learners. This is explained by the fact that when learners are comfortable and familiar with discussion and peer interaction, they are motivated to participate. The learners are relaxed and inspired to think and find ways to put their understanding into practice in their cooperative group learning.

However, not all classrooms in Kirinyaga County have yet made the transition to effective cooperative learning. When the research for this study was undertaken, some teachers facilitated their teaching with individuals and whole class group organisation. In these classes, learners would be seen working out mathematical concepts competences learning tasks alone while the teacher would go round marking, commenting on their individual work, and would at times refer some individuals to a colleague to learn from them. In other cases, the teacher would appoint someone to do the sums on the blackboard while the others watched and followed.

In other instances, the teacher would have the whole class in front and demonstrate as they followed from there. The learners would crowd around the teacher as they responded in chorus as the teacher prompted.

On asking one teacher about it, the researcher received this response:

*'When they (learners) are near me (at the blackboard) they are easily controlled and they tend to be more attentive. While they are seated, some tend to make noise, while others get distracted elsewhere. You see like now that you are here, some would be following who the visitor is and what you are doing/writing. By the way, due to that the class would have been so much interrupted by continuous reporting amongst themselves about those not following our learning.'*

This would be explained by the reasoning put forward by Gillies and Boyle (2010) that if pre-school teachers perceive CLM as neither rewarding to their needs nor the needs of their learners, it is possible that they will not adopt the method when they are instructing mathematical concepts. This would be explained by the emotional dispositions that impact on a teacher's behaviour, since teachers are most likely to adopt the method of teaching which they prefer, which is generally the one that they find helpful and that they feel confident in delivering (Abrami et al., 2014). Much mentoring on the use of CLM as an instructional method should be effected on teachers in order to promote their self-efficacy on the use of the same.

### 3.3 Teachers Supporting Learners with Learning Provisions and Learners' MCCA

The use of appropriate educational materials is equally as important as the use of effective teaching methods in mathematical concepts competences lessons. Mehra and Thakur (2008) consider the use of learning aids is a key component for teachers in developing learners' attitude to mathematical concepts competences learning.

The way in which teachers supported learners providing suitable learning resources was analysed by the extent and variety of the resources provided: only one type of learning aid, two types of learning aids, three types of learning aids and more than three types of learning aids. This is presented in Table 3.

**Table 1: Teacher Support of Learners with Learning Resources and Learners' MCCA**

Status	No of Teachers	Pre-school learners' MCCA				Status %
		Below Expectation	Approaching Expectation	Meeting Expectation	Exceeding Expectation	
	N=20	n=7	n=73	n=217	n=342	N=639
Teachers applying learning resources						
Done	90%	1%	10%	60%	30%	93%
Not done	10%	3%	15%	36%	45%	7%
Teachers applying no learning resources at all						
Done	10%	3.4%	15.4%	45%	36%	7%
Not done	90%	0%	10%	30%	60%	93%
Teachers applying only one type of learning resource						
Done	10%	0%	4%	10%	85%	8%
Not done	90%	1%	12%	36%	51%	93%
Teachers applying two types of learning resources						
Done	45%	0%	8%	29%	63%	45%
Not done	55%	2%	14%	38%	6%	55%
Teachers applying three types of learning resources						
Done	15%	0%	17%	37%	46%	22%
Not done	85%	1%	11%	34%	55%	78%
Teachers applying more than three types of learning resources						
Done	20%	0%	10%	29%	61%	30%
Not done	80%	1%	12%	35%	52%	70%

Table 3 indicates that the majority of learners were supported by teachers who supplied them with a variety

of learning aids (93%), and only a very small proportion was not (7%). The lowest percentage of learners (8%) were taught by teachers who provided only one type of learning aid, 45% were provided with two, 22% were provided with three and 30% were provided with more than three types of learning aids. This is not the only study to have shown that the use of concrete materials can produce meaningful use of notational systems and increase learners' development in competence in mathematical concepts.

The researcher observed a variety of learning supplies provided during learning, which included:

*Bottle tops and blackboard sketches drawn by the teachers that served as counters, whereas in some classes learners counted their jumps. Numbers written on the blackboards were also used as counters, as well as rulers, pencils, shoes, learners themselves, water jerry cans, thermos flasks, exercise and textbooks, food dishes, and so on. A variety of songs that were oriented in the basic mathematical operations (like addition and subtraction) were appropriately applied in the learning tasks. They would be sung alongside learning tasks involving bottle tops and skittles. Other available learning resources utilised were tubers, sticks, seeds, beads, maize cobs, and pebbles.*

The majority (over 80%) of all the categories of learners who were supplied with learning aids met and exceeded expectation in their achievement. This attested to the fact that the availability of a variety of learning aids influences the utilisation of CLM and consequently increases learners' performance. This concurs with Douglass and Kristin (2000), who conducted a comprehensive review of activity based on learning in mathematical concepts competences from kindergarten all the way to grade eight and concluded that using a variety of materials (especially those that are easy to handle and manipulate) produces greater achievement gains than not using them.

Where no learning aid was supplied at all, the score was low (36%) for learners who exceeded expectation, while where learning aids were supplied, the score increased to 60%. It was also found that the majority of learners whose teachers did not supply any learning aid at all (45%) only achieved at Meeting expectation, whereas among their counterparts who had learning aids only 30% of them scored that same grade.

Learning aids should include a multisensory nature in order to enable pre-school learners to develop their ability to represent mathematical concepts in the real world. This practice should see learners being supplied with a variety of learning resources, as well as being given multiple opportunities to practise representing different mathematical concepts in order to carry out and understand the expected operations competently. Eshiwani as cited by Kamau (2007) noted that sustainable use of concrete instructional materials by teachers who are knowledgeable in their use improves learners' MCCA and consequently their attitude to learning. Manipulation of learning resources by learners stimulates their imagination and innovation, and encouragement of what they are doing. This motivates their cooperative group learning accomplishments, leading to improved mathematical concepts skills acquisition.

### **3.4 Teacher's Engagement Behaviour in CLM Activities and Learners' MCCA**

Performing the role of teacher well is essential to learners' educational development; this is based on the assumption that teachers prompt learners to understand a mathematical concept personally and are competent in it before explaining it to peers in a CLM setting (Andreas and Seth, 2013).

For the purpose of this study, the engagement behaviour of the teacher in CLM activities in the learning process was analysed against teachers performing a number of different activities: taking time to share ideas and opinions with learners; paraphrasing to learners; describing learners' feelings; integrating learners' ideas; having learners justify their responses; extending learners' responses; setting aside time for learners to reflect on their experience while working in a CLM group; providing procedures for learners to use in discussing group effectiveness; including group-processing questions in the assignment sheet; providing constructive feedback; criticising flawed aspects of learners' ideas without criticising the learners; differentiating between the ideas and reasoning of group members; providing results to CLM groups; providing results to individual learners; having learners editing each other's work and keeping groups small.

The information found about teacher engagement behaviour is presented in Table 4.

**Table 4: Teachers' Engagement Behaviour in CLM Activities and Learners' MCCA**

Status	No of Teachers	Pre-school learners' MCCA				Status %
		Below Expectation	Approaching Expectation	Meeting Expectation	Exceeding Expectation	
	N=20	n=7	n=73	n=217	n=342	N=639
Taking time to share ideas and opinions with learners						
Done	100%	1%	11%	34%	54%	100%
Not done	0%	0%	0%	0%	0%	0%
Taking time to paraphrase to learners						
Done	100%	1%	11%	34%	54%	100%
Not done	0%	0%	0%	0%	0%	0%
Taking time to describe learners' feelings						
Done	100%	1%	11%	34%	54%	100%
Not done	0%	0%	0%	0%	0%	0%
Taking time to integrate learners' ideas						
Done	100%	1%	11%	34%	54%	100%
Not done	0%	0%	0%	0%	0%	0%
Taking time to have learners justify their responses						
Done	100%	1%	11%	34%	54%	100%
Not done	0%	0%	0%	0%	0%	0%
Taking time to extend learners' responses						
Done	100%	1%	11%	34%	54%	100%
Not done	0%	0%	0%	0%	0%	0%
Setting aside time for learners to reflect on their experience working in a CLM group						
Done	85%	1%	11%	36%	50%	89%
Not done	15%	0%	0%	17%	83%	11%
Providing procedures for learners to use in discussing group's effectiveness						
Done	5%	4%	17%	67%	13%	4%
Not done	95%	0%	0%	17%	83%	96%
Group-processing questions included in the assignment sheet						
Done	5%	4%	17%	67%	13%	4%
Not done	95%	1%	11%	33%	55%	96%
Providing constructive feedback						
Done	100%	1%	11%	34%	54%	100%
Not done	0%	0%	0%	0%	0%	0%
Criticising ideas without criticising people						
Done	100%	1%	11%	34%	54%	100%
Not done	0%	0%	0%	0%	0%	0%
Differentiating between ideas and reasoning of group members						
Done	100%	1%	11%	34%	54%	100%
Not done	0%	1%	13%	36%	50%	0%
Giving results to CLM groups						
Done	30%	0%	10%	36%	53%	28%
Not done	70%	2%	12%	36%	33%	72%
Giving results to individuals						
Done	100%	1%	11%	34%	54%	100%
Not done	0%	0%	0%	0%	0%	0%
Letting learners edit each other's work						
Done	25%	0%	5%	24%	71%	27%
Not done	75%	2%	14%	38%	38%	73%
Keeping groups small						
Done	75%	0%	10%	28%	62%	69%
Not done	25%	4%	17%	51%	29%	31%

From Table 4 it can be seen that there was a relatively large disparity between learners whose teachers set time aside for them to reflect on their experience of working in a CLM group (89%) and those who did not (11%). Teachers who provided learners with procedures to use in discussing group effectiveness, including group processing questions in the assignment sheet, all had learners who achieved (4%), against those who did not provide any procedures for their learners (96%).

Every teacher (100%) took time to provide constructive feedback to learners, criticise ideas without



criticising learners and differentiated between ideas and reasoning of group members. In this instance and in accordance with the findings, all the teachers were teaching in agreement with teaching theory. Theoretically, feedback conditions learners to be highly motivated to care about each other's learning and achievement by asking freely for assistance, giving detailed explanations, testing for understanding, and monitoring each member's learning progress (Wigfield and Eccles, 2000).

Group celebration is a form of reward for interdependence; the feedback received during group processing is aimed at improving the use of social skills and is a form of individual accountability (Gillies, 2014). When teachers do not initiate this kind of interaction they risk letting learners interact on a somewhat superficial level (Cohen 1994; Renkl 1997).

The researcher observed the following scenarios:

*Some learning environments were 'unique' from the known conventional learning standard environment. The researcher observed that learning in these classes would happen when all the learners were crowding around the teacher and standing for the entire lesson. The teacher 'sung' the learning content material as the whole class group chanted back. Some learners were not even attentive to what the teacher was presenting on the blackboard; they shouted as the teacher prompted the class to do things but had a complete lack of contact with the lesson. The lesson would continue without the teacher noticing that these learners were not hands-on in the lesson but doing their own things behind others. Since there were no exercises or lesson tasks for the learners from the teacher, the lesson would just end 'unceremoniously' for some learners.*

Less than a third of teachers (28%) gave results to their CLM groups, as opposed to those who did not (72%). The exchange of knowledge and skills in CLM must be supported by group processes, and feedback or reward for the learning of the group members (Huber et al., 2001). That is why results on the cooperative learning groups' performance are extremely critical for their motivation, as well as for taking any other necessary decision-making with regards to individual group activities during learning.

The data presented in Table 4 shows that every teacher (100%) took time to carry out one or more of the CLM activities listed. Noticeably the scores were progressive in all instances from the lowest to the highest mean score index. The mean score indices achieved by the learners were Below expectation (1%); Approaching expectation (11%); Meeting expectation (34%); and Exceeding expectation (54%).

This grading achievement was for learners whose teachers were taking time in sharing ideas and opinions with learners; paraphrasing to learners; describing learners' feelings; integrating learners' ideas; having learners justify their responses; extending learners' responses; providing results to individual learners; providing constructive feedback by the teacher; criticising ideas without criticising the learners; and differentiating between ideas and reasoning of group members. However, learners taught by teachers who provided procedures for learners to use in discussing the group's effectiveness and carried out group-processing with questions included in the assignment sheet did not achieve the would-be expected highest score of exceeding expectation, in actual fact only 13% exceeded expectation.

*It is worth noting that some of the observed teachers gave feedback to the learners as the learners participated on the blackboard. This was done through general comments to the class by the teacher. If anything, during the learning session the learners were more concerned with their individual work than the group set activities. A significantly large proportion of teachers would like to employ the CLM learning organisation in their mathematical concepts classes. Nonetheless, there could be challenges or impediments facing the use of the method despite the high desire and even positive attitude towards them. This conforms to the findings of Farrow (2012) that successful adoption of CLM in teaching basic arithmetic skills is all about teacher attitude and beliefs.*

It is important to note that the proactive role of the pre-school teacher must be seen to involve the creation of a zone of proximal development, where the teacher provides scaffolding for mathematical concepts competences learning. This helps the learner to understand from their own perspective (Idowu, 2012). Abrami et al. (2014) also explain that teachers with an attitude towards a certain phenomenon in class develop emotional dispositions that influence their choice of a method of teaching that they enjoy, feel confident in using or find helpful.

A similar progression pattern was seen where the majority of learners who were taught by teachers who set aside time for them to reflect on their experience working in a CLM group exceeded expectation (50%) or met expectation (36%).

There were very few learners (4%) whose teachers provided procedures for them to use in discussing group effectiveness. The figure was also 4% for those learners whose teachers included group-processing questions in the assignment sheet. The majority of these learners met expectation (67%). The number of learners who were approaching expectation (17%) was greater than the number of learners who exceeded expectation (13%). In fact, the highest percentages of learners were approaching expectation across all CLM activities.

It was also in the two aspects of providing procedures for learners to use in discussing group effectiveness

and including group-processing questions in the assignment sheet where there was the highest percentage of learners scoring below expectation (4%). There were no learners below expectation among those whose teachers got them to edit each other's work and who kept the learning groups small. The majority of these learners exceeded expectation - 71% for learners who edited each other's work and 62% for learners whose teachers kept the learning groups small.

For grading, the learners who were given results in groups and as groups and as individuals, the majority exceeded expectation (53% and 54% respectively). The findings showed that the method of giving out results either individually or in a CLM group did not influence learners' performance.

The percentage of learners where they edited each other's work is quite low at 27%, whereas where the CLM groups were kept small, the percentage was 69%. The grading increased when groups were kept small, with no learner (0%) scoring below expectation, 10% approached expectation, 28% met expectation and 62% exceeded expectation. This implies that the amount of time taken by teachers in CLM activities influences learners' performance and that there is a correlation between the two.

Furthermore, there is an implication that when teachers commit themselves to carrying out these CLM activities, learners construct their own knowledge through dialogical pedagogy by argumentation and discussion in their cooperative learning groups. This promotes effective conceptual learning and the ability for teachers to act accordingly (Corcoran, 2012). Teachers should be urged to adopt pedagogical approaches that are more suited to the characteristics of young children. These would allow the learners to develop sufficient ability to construct knowledge through play and participation in mathematical concepts activities.

### 3.5 Teacher Monitoring Behaviour of the Learning Process and Learners' MCCA

While conducting a mathematical concepts competences lesson, the teacher monitors each cooperative learning group and intervenes whenever needed to improve on the task work and teamwork. Furthermore, the teacher gathers specific facts about promotive interaction, the use of targeted social skills, and engagement in the desired interaction patterns. This data is used to intervene in groups and to guide group processing.

Teachers' monitoring behaviour of the learning process was weighed against how they assessed learners by asking in-depth questions, teachers' generation of further answers and testing reality by checking CLM group work. This information is presented in Table 5.

**Table 5: Teacher Monitoring Behaviour of the Learning Process and Learners' MCCA**

Status	No of Teachers N=20	Pre-school learners' MCCA				Status % N=639
		Below Expectation n=7	Approaching Expectation n=73	Meeting Expectation n=217	Exceeding Expectation n=342	
Probing learners by asking in-depth questions						
Done	100%	1%	11%	34%	54%	100%
Not done	0%	0%	0%	0%	0%	0%
Generation of further answers						
Done	95%	1%	11%	33%	55%	96%
Not done	5%	4%	17%	67%	13%	4%
Testing reality by checking CLM groups' work						
Done	90%	1%	11%	34%	56%	92%
Not done	10%	2%	17%	54%	27%	8%

Table 5 illustrates that every learner (100%) had a teacher who monitored their learning process. This was done by assessing learners and asking in-depth questions. 96% of learners were taught by teachers who sought to generate further answers, whereas 92% had teachers who tested reality by checking their CLM group work. In essence, as a method of pedagogy, CLM is based on the recognition that human beings are helpful and social individuals who are driven by cooperation and pro-social and humanistic motives (Deutsch, 1973). However, the researcher observed that this aspect was neglected where no groups were formed during the learning session. This would confirm the finding by Muriithi (2013) that a considerable number of teachers have a negative attitude towards hands-on teaching methods, of which CLM is one. This is an indication of unfavourable attitude towards CLM as an instructional method; that would eventually affect learners' attitude towards it and the cycle would negatively affect mathematical concepts competence acquisition.

In the three aspects of teacher monitoring behaviour of the learning process, the majority of learners exceeded expectation or met expectation. Firstly, for teachers probing learners by asking in-depth questions, 54% exceeded expectation and 34% met expectation; secondly, for teachers who generated further answers, 55% exceeded expectation and 33% met expectation; lastly, for those teachers who tested reality by checking CLM group work, 56% exceeded expectation and 34% met expectation.

This is attributable to the fact that teacher monitoring behaviour of learners' learning and intervening as

necessary enables learners to complete learning tasks successfully and use the set interpersonal and group skills effectively (Oner, 2013). Monitoring is a key component of CLM. According to Moore (2008), learners' academic achievement is based on the effectiveness of the instructional method adopted by the teacher. Organising learning in small groups does not necessarily imply that learners work together and support each other in mastering their learning tasks. As an essential part of teachers' role, they are required to harmonise and set up the class as a suitable learning environment that enables learners to cooperate in their group learning.

The teacher should keenly observe to know mathematical concepts activities to be given to each learner (Hewett, 2001). Through observation a teacher will be able to offer meaningful mathematical activities that promote learning through stimulation of imagination, enhanced communication, problem solving and co-operating skills.

### 3.6 Regression Model and Coefficients of Determination on Teacher Attitude to CLM and Learners' MCCA

The hypothesis to test the extent to which there is a difference between the mean score index of pre-school learners taught by teachers with favourable and unfavourable attitudes towards CLM was used to verify the relationship and the nature of relationship between teacher attitude to CLM and the MCCA of pre-school learners in Kirinyaga County.

The hypothesis was tested using a statistical process that involved establishing whether there was any significant association between teacher attitude to CLM and MCCA in pre-school learners. Regression model analysis was run in order to establish whether there was a predictive association between teacher attitude to CLM and the MCCA of pre-school learners.

Table 6 presents the regression model data on teacher attitude to CLM and its predictive relationship with its indicators.

**Table 6: Teacher Attitude to CLM and Learners' MCCA**

Model Summary						
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate		
1	0.107 <sup>a</sup>	0.110	0.100	0.728		
ANOVA						
Model	Sum of Squares	df	Mean Square	F	Sig.	
Regression	3.871	1	3.871	7.309	0.007 <sup>b</sup>	
Residual	337.368	637	0.530			
Total	341.239	638				
Coefficients						
Model	Unstandardised Coefficients		Standardised Coefficients	t	Sig.	
	B	Std. Error	Beta			
(Constant)	3.179	0.086		36.799	0.000	
Teacher attitude status	0.164	0.061	0.107	2.704	0.007	

*a. Dependent Variable: Mathematical Concepts Competences Acquisition*

*b. Predictors: (Constant), Teachers' Attitude*

From Table 6, it can be seen that adjusted R Square = 0.100, equivalent to 10% (0.100×100). The implication is that teachers' attitude to CLM accounts for a 10% variation in MCCA across pre-schools in Kirinyaga County. This means that there are other factors, which account for 90%, that have an impact in influencing MCCA, besides teacher attitude to CLM.

Furthermore, the results indicate that (F (1, 637) = 7.309, P<0.05, p=0.007), demonstrating that teacher attitude to CLM is a significant predictor of MCCA in pre-school learners at a significance of P<0.007. Coefficients of determination results are as outlined:  $\beta=0.107$ ,  $t=2.704$  and  $p<0.007$ . A unit increase in teacher attitude to CLM leads to a variation of 0.107 units. This is an indication that teacher attitude to CLM influences MCCA in pre-schools learners in Kirinyaga County. Positive teacher's disposition towards CLM should be cultivated at all costs because it seems to correlate with positive achievement of mathematical concepts competences among pre-schools learners in Kirinyaga County.

In addition, a regression model procedure was carried out in order to identify the strength of the effect of teacher attitude on pre-school learners' MCCA. Table 7 presents the regression model data on teacher attitude to CLM and its predictive relationship with its indicators.

**Table 7: Teacher Attitude to CLM and Learners' MCCA**

Model Summary						
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate		
	1	0.305 <sup>a</sup>	0.093	0.085		
ANOVA						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	31.848	6	5.308	10.843	0.000 <sup>b</sup>
	Residual	309.392	632	0.490		
	Total	341.239	638			
Coefficients						
Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error			
	(Constant)	4.672	0.295		15.839	0.000
	Teacher's level of preparation	0.023	0.075	0.015	0.308	0.758
	Teacher's level of involvement	0.023	0.115	0.009	0.197	0.844
	Teacher's level of learning resource provision	0.450	0.069	0.274	6.510	0.000
	Teacher's amount of time taken in CLM activities	0.131	0.061	0.087	2.141	0.033
	Teacher's level of monitoring	0.510	0.105	0.191	4.833	0.000

a. Dependent Variable: Mathematical Concepts Competences Acquisition

b. Predictors: (Constant), Teacher's level of monitoring, Teacher's amount of time taken in CLM activities, Teacher's level of involvement, Level of learning resource provision, Level of Interaction, Teacher's level of preparation

Table 7 indicates that the level at which pre-school teachers provide learning resources to their learners had a correlation coefficient of  $r=0.274$ ,  $t=6.510$ ,  $p<0.05$ ,  $p=0.000$ , whereas teachers' level of monitoring had a correlation coefficient of  $r=0.191$ ,  $t=4.833$ ,  $p<0.05$ ,  $p=0.000$ . This is an indication that teachers' level of provision of learning resources and their level of monitoring of pre-school learners' cooperative group learning activities are significant predictors of improved MCCA for learners in Kirinyaga County.

Nevertheless, the result of teachers' level of preparation of their professional documents was:  $\beta=0.015$ ,  $t=0.308$ ,  $p<0.05$ ,  $p=0.758$ ; teachers' level of involvement in CLM activities was  $\beta=0.009$ ,  $t=0.197$ ,  $p<0.05$ ,  $p=0.844$ ; and the amount of teachers' time taken in CLM activities was:  $r=0.087$ ,  $t=2.141$ ,  $p<0.05$ ,  $p=0.033$ . This would imply that the level of preparation of professional documents, the level of involvement in CLM activities and the amount of time taken in CLM activities by teachers are not predictors of improved MCCA in pre-school learners in Kirinyaga County. This appears to demonstrate inefficacy on the part of teachers in the comprehensive execution of CLM activities. This would hamper their ability to create an active learning environment in which their learners can solve problems, answer questions, formulate questions of their own, discuss, explain, debate, or brainstorm during class (Coppola, 2007).

It is absolutely imperative to note that the proactive role of the teacher must be seen to involve the creation of a zone of proximal development, the provision of scaffolding for learning and the co-construction of meaning with learners based on the teacher's awareness and understanding of the learners' perspective (Idowu, 2012). This is what makes teachers' level of preparation of CLM lesson, teachers' level of interaction with learners in learning activities, teachers' level of involvement in the learning groups and the amount of teachers' time taken in CLM activities vital in order for them to enable each of their learners to develop and achieve their greatest potential.

The finding in this study is consistent with the findings of Bernero (2000) that teacher attitude leads to an increase in their efforts to encourage their learners to discuss the learning content material at the heart of the lesson that will enable each learner to understand and internalise it, with the result that learners encourage each other to work hard for improved academic achievement. Johnson et al. (2014) identified that CLM is a tested means for enabling learners to improve in both their academic attainment and in the quality of their interpersonal relationships. This is rooted in team-based learning, which distinguishes CLM from the competitive and/or individualistic instruction of the traditional classroom.

Correlation coefficients between the indicators of teachers' attitude to CLM included: teachers' level of preparation for teaching, level of involvement in the teaching activities, level of learning resource provision for learners during the learning session, amount of time taken in CLM activities, level of monitoring against MCCA. All of these were tested and Table 8 presents this information.

**Table 8: Pearson's Correlation Coefficient on Teacher Attitude to CLM and Learners' MCCA**

Mathematical Concepts Competences Acquisition	Pearson Correlation	1
	Sig. (2-tailed)	
	N	639
Teacher's level of preparation	Pearson Correlation	0.047**
	Sig. (2-tailed)	0.024
	N	639
Teacher's level of involvement	Pearson Correlation	0.049**
	Sig. (2-tailed)	0.022
	N	639
Teacher's level of learning resources' provision	Pearson Correlation	0.022**
	Sig. (2-tailed)	0.000
	N	639
Amount of teacher's time taken in CLM activities	Pearson Correlation	0.003**
	Sig. (2-tailed)	0.408
	N	639
Teacher's level of monitoring	Pearson Correlation	0.014**
	Sig. (2-tailed)	0.000
	N	639

\*\**. Correlation is significant at the 0.01 level (2-tailed).*

\**. Correlation is significant at the 0.05 level (2-tailed).*

The results in Table 8 show that although all the indicators generated significant levels of MCCA among pre-school learners, there only exists a low positive correlation between all of them. Teachers' level of preparation registered a correlation coefficient of  $r=0.047$ , teachers' level of involvement was  $r=0.049$ , their learning resources provision was  $r=0.022$ , the amount of their time taken in CLM activities was  $r=0.003$  and their level of monitoring was  $r=0.014$ . Therefore, as they all have  $p<0.05$ , the conclusion can be drawn that these indicators are predictors of improved pre-school learners' MCCA.

This agrees with the view of Biggs (2007) that effective teaching does not simply involve applying general principles of teaching, rather it should aim to engage students in learning-related activities that enable them to theorise, generate new ideas, reflect and solve problems in the target content area. Provision of learning resources by teachers stimulates learners' imagination and innovation, and monitoring of learning activities assures learners of their teacher's assessment and encouragement of what they are doing. This motivates their cooperative group learning activities, leading to improved mathematical concepts problem-solving skills.

Although, as Lafi (2001) notes, some teachers may only have limited experience and knowledge of how to teach groups cooperatively and how to benefit from this strategy in teaching, this should not discourage them from undertaking CLM activities. This is due to the fact that, as a method of learning together, CLM has a strong focus on interpersonal skills. Each lesson is expected to have a social skills objective as well as an academic objective. This is justified by the evidence that pre-school learners' ability to work cooperatively on the various mathematical concepts tasks and solve the problems as a team gives them practice in developing respect for others' viewpoints, approaches to problem solving and other learning styles. The teacher as instructor is no longer the sole custodian of knowledge in the classroom environment while the learners are passive knowledge receivers.

#### 4.0 Conclusions

The learners whose teachers were favourable towards CLM registered higher mean score indices than those who were unfavourable towards CLM. However, teachers across the range of teaching qualifications were able to apply CLM effectively. Mikre (2011) asserts that teachers' attitude is a key determinant in their use of the CLM and that resistance to using CLM in the classroom is likely to be based primarily on the risk of teachers losing influence over the values and directions of classroom activity. The current research found that teacher attitude is an extremely critical factor in the use of CLM in the facilitation of mathematical concepts competences in pre-school classes and it requires teachers to uphold the beliefs and practices of CLM as a favourable and manageable practical instructional method.

#### 5.0 Recommendations

Teacher training programmes should be restructured to ensure that trainee teachers are able to embed an effective implementation of CLM in addition to other mathematical concepts competences instructional methods into their delivery of learning in the classroom. Regular refresher courses for pre-school teachers are highly recommended for teachers where CLM training should form a key part of the agenda.



School administrators should ensure that they encourage teachers to undertake prior planning and demonstrate the will to implement this. Prior planning will prompt better organisation, which in turn should guarantee efficiency and efficacy of mathematical concepts competences delivery.

Curriculum Support Officers (CSOs) should be mobilised to encourage and monitor pre-school teachers' application of learning resources during the teaching process for competence in mathematical concepts. Where necessary, the government should assist those CSOs tutors who need to be oriented on Early Childhood Education pedagogical skills for greater efficiency.

Due to the fact that CBC does not include all there is in CLM, teachers need to be thoroughly oriented on the expected way of preparing the necessary professional records so that they can comprehensively incorporate the various elements required for their professional practice in their lesson delivery. It is only at such a point that they can blend the CLM aspects into the implementation of their lessons. This finding implies that teacher attitude towards facilitating mathematical concepts competences using CLM should be cultivated in pre-school teachers in order to enhance the mathematical concepts competences acquisition of pre-school learners in Kenya.

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