

## **An Evaluation on the Implementation of 5E Instructional Model in Teaching Geography in Sri Lanka**

*Sharifah nor Puteh and Fared Mohamed Nawastheen*

Centre of Excellence for Education and Learner Diversity, Faculty of Education,  
Universiti Kebangsaan Malaysia, 43600 UKM Bangi, Selangor, Malaysia

---

**Abstract:** The purpose of this study is to evaluate teachers' concerns in implementing the 5E Instructional Model in Sri Lanka. The Concerns-Based Adoption Model (CBAM) was used to identify teachers' Stages of Concern (SoC). The respondents for the survey on SoC consisted of 303 geography teachers from secondary schools in the *Kalutara* district. The study used a questionnaire adapted from the actual instruments of CBAM. The analysis across group of teachers, in terms of types of school and where they were located, revealed significant differences in their stages of concerns regarding the 5E instructional model — mainly in personal, management, consequence and collaboration. The results suggested that geography teachers are conscious of the 5E implementation. Alternative strategies are needed to take the teachers from the stage of personal concerns into task concerns and impact concerns, to ensure success of the curriculum reforms.

**Key words:** 5E Instructional Model • Concerns-Based Adoption Model (CBAM) • Curriculum Reforms • Teachers' Stages of Concern • Geography Teachers • Sri Lanka

---

### **INTRODUCTION**

There has been widespread agreement that a transformation of education through curricular changes is needed in order to meet new challenges and demands of the 21<sup>st</sup> century. Factors such as the new information age, major economic shifts and resurgence and redefining of democracy around the globe are influencing both developed and underdeveloped countries. These factors are motivating these countries to revisit their education systems and to make reform initiatives [1]. Most of the countries look at curriculum development as one of the leading themes of the educational reform initiatives. Changes in content of teaching and learning and understanding a curriculum as a technical instrument and a process have been revisited in these reforms [2]. New instructional approaches also are to be addressed in the curriculum reforms, because current students are challenged with new demands of learning. Teaching students what we were taught in previous eras is now considered inappropriate and outdated. Our children and grandchildren will need to learn totally different things and in totally different ways than what we know today or as today's curricula describe [3].

The Democratic Socialist Republic of Sri Lanka is an island and a tropical country. It is dubbed the "Pearl of the Indian Ocean." The country has a diversity of religious and ethnic populations and Sinhala and Tamil are recognised as national languages. Sri Lanka has shown good achievements in literacy, education enrolment and equal opportunity and access to education [4]. These significant achievements in education were reached through endeavours and provisions for education — especially free education — for more than 60 years by various governments after the country won independence. The contemporary structure of the education system is divided into six parts: Pre-School Education/ECCD, Primary Education, Junior Secondary Education, Senior Secondary Education, Collegiate Level and Tertiary Level.

Reforms in the school curriculum have been introduced from time to time. In line with global trends, Sri Lanka introduced its first school curricular reforms in the new millennium. The curricular reform beginning in 2007 has been referred to as Modernised Competency-Based Curriculum Reform. It has brought some salient changes in terms of teaching competencies, changing roles of teachers, new instructional approach and introduction of

new subjects. The reforms emphasized more active learning by urging teachers to change their roles from transmission to transformational. In the context of developing skills for the 21<sup>st</sup> century, teachers are required to be facilitators and guides in a learning environment, rather than merely purveying knowledge.

Introducing the 5E instructional model was one of the significant features in the reforms. The curriculum reform saw a shift from objective-based to competency-based pedagogy. It was believed that the 5E instructional model was more suitable in developing competencies using a constructive learning environment.

**The 5E Instructional Model:** The 5E instructional model, as an inquiry-based approach, allows students to develop their own conceptual understanding via a series of experiences and inquiries [5-8]. The model gives students the opportunity to learn through various activities

Structured by the teacher. The model has five phases: *Engagement, Exploration, Explanation, Elaboration and Evaluation*. Each phase has a specific function and contributes to the teacher's coherent instruction and to the students' formulation of a better understanding of scientific and technological knowledge, attitudes and skills. The model helps to develop 21<sup>st</sup> century skills such as adaptability, complex communication or social skills, non-routine problem-solving, self-management or self-development and system thinking among the students [9].

The first phase of 5E model is *Engagement*, where the teacher attempts to make connections between past and present knowledge of a concept. In this stage, the teacher tries various techniques to inspire interest and curiosity among students about the topic. In the *Exploration* phase, students are allowed to work in groups, similar to cooperative learning activities, in order to gain common and concrete experiences. This phase helps the students construct concepts and develop skills. Students seek their own answers for problems and the teacher plays the role of a facilitator by providing necessary guidance [10-11]. In the third phase, *Explanation*, students come forward to describe their own understanding about the concepts, using evidence to support their answers. The teacher introduces formal definitions and explanations of concepts to draw upon students' experiences during the exploratory activities [10]. *Elaboration* is the fourth phase, where students are provided with opportunities to apply and extend the concepts and skills in new but related situations. Sometime students may have misconceptions about the topics. It is believed that the activities will help students correct their remaining

misconceptions and generalize the concepts in a broader context [12]. The last phase is *Evaluation*, whereby the teacher evaluates students' understanding of concepts, skills, applicability and changes in thinking. Although this phase is indicated as the last in the 5E model, assessment and evaluation can take place throughout the learning and teaching process.

The 5E model enables students to analyse and synthesise new information in constructivist classrooms. It is the most practical model in the constructivist approach for learning. The number of research studies carried out on the use of the 5E instructional application in teaching various subjects found that it is more effective compared to traditional methods in developing conceptual understanding among the students [13, 14, 15 and 16]. The 5E model was adapted into the curriculum reforms in Sri Lanka in 2007. It is applied as the pedagogical approach for teaching all subjects in secondary school curricula, helping students to attain desired learning outcomes and develop 21<sup>st</sup> century skills.

#### **Introducing Geography in a School Curriculum:**

Generally, the subject of geography is taught to enhance students' understanding and usage of places and regions, physical and human systems and environment and society. Geography was introduced as one of the core subjects in the secondary school curriculum in 1972 in Sri Lanka. Then it was integrated with environmental studies at the grade 6 level and with social studies for grades 7-11 until 2003. The National Education Commission (NEC) in 2003 re-introduced geography into the school curriculum as a compulsory subject for grades 6-9 and as an optional subject for grades 10-11. The purpose is for students to acquire a wide range of transferable skills, such as collecting and analysing statistical data, drawing conclusions, reading and construction of maps, using globes, atlases, satellite images and ICT and engaging in geographical inquiry inside and outside the classroom to learn about a wide range of people, places and environment and their interface [17].

The study of concerns has attracted a great deal of attention as a result of the presumed link between the levels and type of an individual's concerns and the successful implementation of innovations and reforms. A concern is the composite representation of the feelings, preoccupations, thoughts and consideration given to a particular issue or task. It includes questioning, analyzing, reanalyzing, considering alternative actions and reactions and anticipating consequences [18]. Teachers' concerns regarding educational changes and curricular reforms,

therefore, can be described as the feelings, thoughts and reactions in regard to new programs and innovations which they are required to adopt in their work environment. The level and type of teachers' concerns exert a powerful influence on the implementation of educational change, as their perceptions and actions determine the success of the innovations. The significance or meanings that teachers attach to the curricular innovations form their reactions to the innovations — and the possible problems associated with these reactions [19].

The present study employed the Concern-Based Adoption Model (CBAM) as its conceptual framework for evaluating teachers' concerns in implementing the 5E instructional approach in Sri Lanka. CBAM is an implementation model that has been widely accepted in educational studies in recent years, because of its focus on individuals' reactions to the change process [20, 21]. CBAM has become a more prominent and effective approach in evaluating curriculum implementation processes. It is mainly concerned with describing, measuring and explaining the process of change from the viewpoints of teachers. Not only does it provide a framework and essential tools to the researchers, but it also focuses on the individuals who are responsible for implementing the change at the classroom level [22, 23]. CBAM is a unique model because it has three diagnostic dimensions: Stages of Concern (SoC), Levels of Use (LoU) and Innovation Configuration (IC). SoC and LoU deal with the affective and behavioural aspects of individuals who are engaged with an implementation process. The IC focuses on the attributes of the change that enable it to succeed. The SoC deals with the readiness of individuals in an innovation process and their feelings and views about the innovation that they are engaging in. The SoC dimension suggests that

teachers move through seven stages of concerns as they adopt a reform: awareness (unconcerned), information, personal, management, consequences, collaboration and refocusing [24, 25]. Table 1 shows the stages of concern and teachers' reflection at each stage regarding a curriculum reform. In the curriculum implementation process, teachers move through from stage 0 to stage 6 according to their experiences and willingness.

The success of any curriculum reform or change depends on a number of factors. One consists of teachers and their attitudes and behaviours. It is indisputable that teachers are key to the success of curriculum reforms. Teachers' knowledge, beliefs and perceptions play a fundamental role in understanding the reforms [27, 28 and 29]. The investigation on teachers' concerns in the implementation of the 5E instructional approach is expected to provide information on the degree to which teachers are capable of effectively implementing the new curricular change as planned. The study of teachers' concerns can also facilitate planning of programs and support systems aimed at sustaining the innovations and meeting relevant needs. More importantly, findings of the study may provide avenues for policy-makers and educational leaders to acknowledge and identify the concerns of teachers in order to increase the prospects of success for curriculum reforms.

**Method**

**Aim and Objectives:** The purpose of the study was to evaluate teachers' stages of concern regarding implementing the 5E instructional approach in Sri Lanka. Specifically the objectives are: i) to determine teachers' stages of concern in implementing the 5E instructional approach in their classrooms; and ii) to identify differences in stages of concerns in terms of medium of instruction and type of schools.

Table 1: Stages of Concern (SoC)

Stages	Teachers' reflection
Stage 0: Unconcerned/ Awareness	Teachers have little knowledge about curriculum reforms. It indicates teachers are not ready to be involved in the curriculum reform process.
Stage 1: Informational	Teachers possess knowledge about the curriculum reforms and show their willingness to learn about it.
Stage 2: Personal	Teachers start to think about impact of curriculum reforms at a personal level and about their limitations related to the reforms.
Stage 3: Management	Teachers focus on processes and tasks of using the reforms. They concentrate on solving problems and difficulties related to the reforms.
Stage 4: Consequence	Teachers start to focus on how the reforms will affect their students.
Stage 5: Collaboration	Teachers begin to share ideas and observe what their peers are doing with the reforms.
Stage 6: Refocusing	Teachers concentrate on more strategies for better implementation of reforms.

Source: [26]

**Research Questions:** The study will focus on the following research questions: i) What are teachers' stages of concerns in implementing 5E instructional approach? ii) Are there significant differences in the teachers' concerns regarding their instruction based on demographic variables, medium of instruction (*Tamil and Sinhala*) and type of schools (1AB, 1C and Type 2).

**Population and Sample:** The population for this study consisted of geography teachers teaching grade 9 students in the secondary schools in the *Kalutara* district of Sri Lanka. Teachers from 305 schools participated in the study. There were no reliable data about deployment of geography teachers in these schools. Therefore a purposive sampling was chosen and a total of 400 questionnaires were distributed to all schools in the district. A total of 303 (75.8%) teachers included 201 using the *Sinhala* medium and 102 using the *Tamil* medium. The respondents represented various types of schools, ages, experience levels, locations and academic as well as professional qualifications.

**Instrument:** The present study utilised the quantitative survey method to determine teachers' stages of concern. The Stages of Concern Questionnaire (SoCQ) was adopted in the study. The questionnaire contains 35 items that represent all seven stages of concern and has a scale from 0 (irrelevant) to 7 (very true for me now). There are 5 questions per each stage of concern. In addition, there are 5 open-ended questions meant to find further details related to the change process. The SoCQ was translated into the local languages *Sinhala* and *Tamil* and adapted to local contexts and content of the study. The translated version was edited by experts in these languages. The questionnaire was piloted for validity and reliability. A total of 80 teachers from both languages (*Sinhala and Tamil*) were selected for the pilot study. Analysis of the pilot study showed that the Cronbach's Alpha for all seven categories of SoC were closed to 0.8 (mean = 0.7841). The results showed that the translated questionnaire has an acceptable reliability level for measuring stages of concerns of teachers.

**Data Analysis:** Data collection procedures and analysis used in the study are showed in Table 2. Descriptive statistics such as frequency, mean and standard deviation were used for determining teachers' stages of concern. The scale of intensity is set at 1.00-2.40 (very low); 2.41-2.80 (low); 2.81-4.20 (average); 4.21-5.60 (high); 5.61-7.00 (very high). The T-test and one-way ANOVA were used to identify the differences of Stages of Concern in terms of medium of instruction and type of schools.

## RESULT AND DISCUSSION

**Research Question 1: Teachers' Concerns:** Table 3 summarize the analysis of teachers' stages of concern regarding implementing the 5E instructional approach in their instructions. Mean scores were calculated for determining States of Concern in implementing the 5E instructional approach in Sri Lanka. Based on scale of intensity, teachers showed high concern levels (4.5-5.31) at particular stages of concern. The high mean scores of respondents indicate the teachers were well informed about the 5E instructional model. The results of the total highest values of the mean were found at the personal (M=5.31, SD=1.2), consequence (M=5.27, SD=1.09) and collaboration levels (M=5.14, SD=1.28). Mean score for the informational stage (M=4.9, SD=1.23) also was closed at the highest total mean scores of stages of concern.

Based on the results, a number of teachers fell into two major groups: self (personal, informational) and impact concerns (consequence, collaboration). Highest mean value in personal concerns (M=5.31, SD=1.2) and mean value in informational concerns (M=4.9, SD=1.23) indicates that a number of teachers were still not sure about the requirements and roles they would take on implementing 5E. The results indicate that many teachers still think about how 5E will affect them, while others want more information about 5E. They need more training and workshops to understand 5E. Highest mean scores for consequence (M=5.27, SD=1.09) and collaboration (M=5.14, SD=1.28) showed that a number of teachers knew a good deal about the 5E instructional approach and

Table 2: Research questions and data analysis

Research questions	Instrument and Sample	Data Analysis
1. What are teachers' stages of concerns in implementing the 5E instructional approach?	Questionnaire 303 Teachers	Frequency, Mean, Standard Deviation
2. Are there significant differences in the teachers' concerns in their instructions based on demographic variables: medium of instruction ( <i>Tamil and Sinhala</i> ) and type of schools (1AB, 1C and Type 2)	Questionnaire 303 Teachers	T-Test One-way ANOVA

Table 3: Teachers' Stages of Concern

Stage of Concern (SoC)	N	Mean	SD
SoC0 – Awareness	303	3.18	1.09
SoC1 – Information	303	4.90	1.23
SoC2 – Personal	303	5.31	1.20
SoC3 – Management	303	4.12	1.12
SoC4 – Consequences	303	5.27	1.09
SoC5 – Collaboration	303	5.14	1.28
SoC6 – Refocusing	303	4.59	1.13

Table 4: Independent-groups t-test for medium of instructions

Demographic Variable	Stages of Concern	t	df	Sig (2 tailed)
Medium of Instructions	Unconcerned/Awareness	2.490	301	.013
	Informational	-3.010	301	.003
	Personal	-2.583	301	.010
	Management	-.368	301	.713
	Consequence	-3.473	301	.001
	Collaboration	-3.325	301	.001
	Refocusing	.918	301	.359

what roles they would take in implementing 5E. Teachers at these levels focus on how the 5E instructional model will impact their students. They are more keen to exchange their ideas and practices of 5E with other teachers.

The total lowest values were in awareness (M = 3.18, SD = 1.09), management (M = 4.12, SD = 1.12) and refocusing (M = 4.59, SD = 1.13). This indicates mixed stages of concern among teachers. A considerable number of teachers were well aware of 5E and they were not worried about available resources for implementing 5E in their school curriculums. The mean value of refocusing (M = 4.59, SD = 1.13) indicates that a number of teachers think about alternative approaches that might be better than 5E.

**Research Question 2:** Are there significant differences in the teachers' concerns regarding their instructions based on demographic variables: medium of instruction (*Tamil and Sinhala*) and type of schools (1AB, 1C AND Type 2).

In Sri Lanka, students are taught from first grade to university level in both local languages: Sinhala and Tamil. Providing education in local languages helped the major ethnic groups — Sinhala, Tamil and Moors — to optimize their education. Sinhala is the majority language; Tamil is the language of Sri Lankan and Indian Tamils as well as a majority of the Moors (Muslims).

To see the differences among the teachers regarding their stages of concern about using the 5E instructional approach in terms of medium of instruction and type of schools, two tests were executed. An independent-groups

t-test was executed to determine differences between mediums of instruction. Sinhala and Tamil are the main mediums of instruction in the schools of Sri Lanka. Table 4 summarised the results of t-test for mediums of instruction.

The results of an independent-groups t-test show a significant difference between the Sinhala medium (M= 4.75, SD= 1.30) and the Tamil medium (M = 5.20, SD = 1.01) conditions;  $t(301) = -3.010, p = .003$  regarding the informational stage of concern. For the consequence stage of concern, there was also a significant difference between the Sinhala (M = 5.11, SD = 1.09) and Tamil mediums (M = 5.57, SD = 1.02);  $t(301) = -3.473, p = .001$ . Further, there was a significant difference between the Sinhala medium (M= 4.97, SD= 1.34) and Tamil medium (M = 5.48, SD = 1.09);  $t(301) = -3.325, p = .001$  at the collaboration stage of concern. The results show no significant differences in Sinhala and Tamil mediums at the other stages of awareness, personal, management and refocusing. The significant differences in Sinhala and Tamil mediums were found at the self and impact concerns levels. The results suggest that the Tamil medium teachers show more concern at the self and impact stages than Sinhala medium teachers in implementing the 5E instructional model.

One-way ANOVA was executed for analysing the difference in concerns among the teachers in terms of types of schools in Sri Lanka. Some schools are based on functional grades and streams (1AB, 1C and Type 1,II and 111). The results of the one-way ANOVA are shown in table 5.

Table 5: Analysis of one way ANOVA for type of schools

Demographic Variable	Stages of Concern	Sum of Squares	df	Mean Square	F	p
Type of Schools (1AB, 1C, Type 2)	Awareness	1.051	2	.526	.433	.649
	Informational	9.024	2	4.512	3.015	.051
	Personal	14.972	2	7.486	5.280	.006
	Management	20.407	2	10.204	8.483	.000
	Consequence	12.400	2	6.200	5.340	.005
	Collaboration	10.783	2	5.391	3.300	.038
	Refocusing	3.252	2	1.626	1.260	.285

Analysis of one-way ANOVA showed a significant difference in type of schools at the personal ( $F= 5.2$ ;  $df 2, 300$ ;  $p = .006$ ), management ( $F= 8.4$ ;  $df 2, 300$ ;  $p = .000$ ), consequence ( $F= 5.3$ ;  $df 2, 300$ ;  $p = .005$ ) and collaboration stages ( $F= 3.3$ ;  $df 2, 300$ ;  $p = .038$ ). Further, it showed no significant difference in type of schools at the awareness ( $F= .433$ ;  $df 2, 300$ ;  $p = .649$ ), informational ( $F= 3.015$ ;  $df 2, 300$ ;  $p = .051$ ) and refocusing stages ( $F= 1.26$ ;  $df 2, 300$ ;  $p = .285$ ). The significant differences in type of schools were found at the self, task and particularly at the impact concern levels. The mean values were at the stages of personal (1AB =5.11; 1C =5.64; Type2 = 5.26), management (1AB =3.84; 1C =4.46; Type2 = 4.17), consequence (1AB =5.05; 1C =5.54; Type2 = 5.30) and collaboration (1AB =4.95; 1C =5.40; Type2 = 5.14).

This clearly indicated that teachers from 1C and Type 2 schools have more concerns than 1AB school teachers in implementing the 5E instructional approach. A number of teachers from 1C and Type 2 were at the self-concern stage; this showed that they were not clear about the 5E instructional approach and how they were required to perform. Different levels of resources among the schools and insufficient training and workshops may be causes of this scenario. However, a considerable number of teachers from 1C and Type 2 also were at the early stages of impact concern — consequence and collaboration. Thus teachers in the 1C and Type 2 schools tended to think about how their use of 5E influences students. Further, they wanted to share their experiences among colleagues. They focused on coordination and cooperation in implementing the 5E instructional model. The high levels of concern among the teachers from 1C and Type 2 may be because of their experiences, academic and professional qualifications. Generally it is believed that the teachers move from the self-concern stage to the task concern stage and then to the impact concern stage based on their academic and professional qualifications and experiences. Further analysis based on the teachers' ages, experience, academic levels and professional qualifications in implementing 5E would clarify why teachers' concern

levels varied among the types of schools. Overall, the results clearly indicated that teachers were well aware of the 5E instructional approach.

### CONCLUSION

The 5E instructional approach has been adapted in school curriculums in Sri Lanka since 2007, as part of a competency-based reform effort. Teachers in secondary schools were expected to implement 5E in their subjects to develop desirable competencies in students and engage them in active learning. Present studies aimed to find out the teachers' stages of concerns regarding implementing 5E and differences based on medium of instructions and type of schools. Overall results of this study suggested that geography teachers are highly conscious of the 5E implementation. Highest mean values indicated that a considerable number of teachers fell into two groups: self-concern and impact concern. Many teachers still focus on their personal interests. Continuous training and workshops would help them to move toward other stages of concerns. A number of teachers showed their highest levels concerns at the consequence and collaboration stages. They concentrated on how 5E affects their students and they desired to share their experiences. Analysis of an independent-groups t-test showed a significant difference in Sinhala and Tamil medium teachers, mainly at the informational, consequence and collaboration stages. The analysis of the stages of concerns across group of teachers in terms of their types of school revealed significant differences — mainly in personal, management, consequence and collaboration. The results suggested all teachers are conscious of the 5E implementation. Alternative strategies are needed to motivate the teachers at the personal concern stage to move forward. Professional developments such as continuous in-service training, involving more teachers in workshops and monitoring, would help implement the 5E instructional approach in the school curriculums in Sri Lanka.

## REFERENCES

1. Darling-Hammond and Linda, 2009. Teaching and the Change Wars. The Professionalism Hypothesis. In Change Wars, edited by A. Hargreaves and M. Fullan. Bloomington, Solution Tree.
2. Lönnqvist, Anders, Robin Horn and Neyir Berktaş, 2005. Introduction. In Curriculum reform and implementation in the 21st century, Policies, perspectives and implementation, edited by P. Sahlberg. Istanbul: EU/SBEP, World Bank and Education Reform Initiative.
3. Avenstrup and Roger, 2005. Tomorrow's curriculum today. Social transformation and curriculum. Paper read at Curriculum reform and implementation in the 21st century June, 2005, at Istanbul, Turkey, pp: 8-10.
4. Little and Angela, W., 2010. The politics, Policies and Progress of basic education in Sri Lanka. Paper read at Research on Educational Access, Transitions and Equity.
5. Lederman and Judith Sweeney, 2011. Levels of Inquiry and the 5 E's Learning Cycle Model. In Best Practices and Research Base. National Geographic Science.
6. Abou-Deif, M.H., M.A. Rashed, M.A.A. Sallam, E.A.H. Mostafa and W.A. Ramadan, 2013. Characterization of Twenty Wheat Varieties by ISSR Markers, Middle-East Journal of Scientific Research, 15(2): 168-175.
7. Kabiru Jinjiri Ringim, 2013. Understanding of Account Holder in Conventional Bank Toward Islamic Banking Products, Middle-East Journal of Scientific Research, 15(2): 176-183.
8. Muhammad Azam, Sallahuddin Hassan and Khairuzzaman, 2013. Corruption, Workers Remittances, Fdi and Economic Growth in Five South and South East Asian Countries. A Panel Data Approach Middle-East Journal of Scientific Research, 15(2): 184-190.
9. Bybee, W. Rodger, A. Josepf, Taylor, April Gardner, Pamela Van Scotter, Janet Carlson Powel, Annw Westbrook and Nancy Landes, 2006. The BSCS 5E Instructional Model Origins and Effectiveness, Colorado. A Report Prepared for the Office of Science Education National Institutes of Health.
10. Goldston, M. Jenice, Jeanelle Bland Day, Cheryl Sundberg and John Dantzler, 2009. Psychometric Analysis of a 5E Learning cycle lesson plan assessment instrument. International Journal of Science and Mathematics Education, 8: 633-648.
11. Campbell, A. Meghann, 2006. The effects of the 5E learning cycle model on students' understanding of force and motion concepts Department of Teaching and Learning Principles in the College of Education, University of Central Florida, Orlando, Florida.
12. National Science Teachers, Association, 2006. BSCS 5E Instructional Model. Online, learningcenter.nsta.org/files/PB186X-4.pdf. Access on 21.04.2011.
13. YALÇIN, Fatma AĐGÜL and Samih BAYRAKÇEKEN, 2010. The Effect of 5E Learning Model on Pre-Service Science Teachers' Achievement of Acids-Bases Subject. International Online Journal of Educational Sciences, 2(2): 508-531.
14. TURK, Fatma and Muammer CALIK, 2008. Using differnt conceptual change methods embedded within 5E model. A sample teaching of Endothermic-Exorhermic reactions. Asia-Pacific Forum on Science Learning and Teaching, 9(1).
15. Hanuscin, L. Deborah and Michele, H. Lee, 2008. Using the Learning Cycle as a Model for teaching the Learning Cycle to Preservice Elementary Teachers. Elementary Science Education, 20(2): 51-56.
16. Akar, Elvan, 2005. Effectiveness of 5E learning cycle model on student understanding of Acid-Base Concepts, Secondary Science and Mathematics Education, Middle East Technical University.
17. National Education Commission, 2003. Envisioning Education for Human Development: Proposal for a National Policy Framework on General Education in Sri Lanka. Nugegoda, Sri Lanka, National Education Commission.
18. Hall, G.E. and S.M. Hord, 2006. Implementing change: Patterns, principles and potholes 2nd Edition. Boston: Pearson/Allyn and Bacon.
19. Fullan, Michael, 2007. The new meaning of educational change. fourth edition ed. New York and London. Teachers college, Columbia University.
20. Alsarrani, Nauaf, 2010. Concerns and Professional Development needs of Science Faculty at Taibah University in adopting blended learning, Department of Curriculum and Instruction College of Education, Kansas State University, Manhattan, Kansas.

21. Petherbridge, D.T., 2007. A concerns-based approach to the adoption of web-based learning management systems., Graduate Faculty, North Carolina State University, Raleigh, North Carolina.
22. Bellah, Kimberly, A. and James E. Dyer, 2009. Attitudes and Stages of Concern of Elementary Teachers Toward Agriculture as a Context for Teaching across Grade Level Content Area Standards. *Journal of Agricultural Education*, 50(2): 12-25.
23. Donovan, Loretta, Kendall hartley and Neal Strudler, 2007. Teacher Concerns During Initial Implementation of a One-to-One Laptop Initiative at the Middle School Level. *Journal Of Research On Technology IN Education*, 39(3): 263-286.
24. Kwarteng, Joseph Tufuor, 2009. Status of Accounting Curriculum Implementation. A Concerns-Based Adoption Model Assessment In Ashanti And Central Regions. Master of Philosophy Degree in Curriculum Studies, Department of Arts and Social Sciences Education of the Faculty of Education, University of Cape Coast.
25. Christou, Constantinos, Maria Eliophotou-Menon and George Philippou, 2004. Teachers' Concerns Regarding the Adoption of New Mathematics Curriculum: An Application of CBAM. *Educational Studies in Mathematics*, 57: 157-176.
26. Sharifah, Nor Puteh, Kamarul Azman abt Salam and Kamaruzaman Jusoff, 2011. Using CBAM to evaluate teachers' concerns in Science Literacy for Human Capital Development at the Preschool. *World Applied Sciences Journal*, 14: 81-87.
27. Bantwini, Bungani, D., 2010. How teachers perceive the new curriculum reform: Lessons from a school district in the Eastern Cape. *International Journal of Educational Development*, 30: 83-90.
28. Blignaut, S., 2007. The policy-practice dichotomy can we straddle the divide? *Perspectives in Education*, 25(4): 49-61.
29. Ma, Yun-peng, Hong-biao Yin and Li-fang Tang, 2009. Teacher receptivity to system-wide curriculum reform in the initiation stage a Chinese perspective. *Asia Pacific Educational Review*, (10): 423-432.