### CHAPTER III: REVIEW OF RELATED LITERATURE

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3.1 INTRODUCTION

Review of related literature allows the investigator to acquaint himself with current knowledge in the field or area in which he is going to conduct his research.

The review of related literature enables the investigator to define the units to his field. It helps the investigator to delimit and define his problem.

According to Lokesh Koal (1984) the knowledge of related literature, bring the investigator up to date on the work which other have done and thus to stage the objectives clearly and concisely. The investigator has collected and presented related literatures related to the variables small groups learning strategy and achievement in science, Scientific temper and creativity.

1. Foreign studies
2. Indian studies

3.2 STUDIES RELATED TO SMALL GROUPS LEARNING AND ACHIEVEMENT

3.2.1 FOREIGN STUDIES


Objectives: (i) To find the reading skill of grade 1 & grade 2 students (ii) To find out the achievement of mathematics (iii) To find out the reading sub skills in English. Methodology: This study examined the cross-sectional relations between teacher-child relationship quality (TCRQ) and math and reading achievement in a socio-economically diverse sample of Chinese American first and second-grade children in immigrant families (N=207). Teachers completed a questionnaire measuring TCRQ dimensions including closeness, conflict, and
intimacy, and children completed a questionnaire measuring overall TCRQ. Standardized tests were used to assess children’s math and reading skills. Analyses were conducted to (a) test the factor structure of measures assessing TCRQ among Chinese American Children, (b) examine the associations between teacher and child-rated TCRQ and children’s academic achievement, controlling for demographic characteristics, and (c) examine the potential role of child gender as a moderator in the relations between TCRQ and achievement. Result indicated that teacher-rated TCRQ Warmth was positively associated with Chinese American children’s reading achievement. Two child gender by TCRQ interaction were found: (a) teacher-rated TCRQ Conflict was negatively associated with girls’ (but not boys’) math achievement, and (b) child-rated Overall TCRQ was positively associated with boys’ (but not girls’) reading achievement. These Findings highlight the valuable role of TCRQ in the academic success of school – aged children in immigrant families.

Findings:  This chapter describes the findings of the study emanating from analysis of the qualitative and quantitative data, which I collected before, during, and after the teaching sessions with my students. My action research project was designed to focus my teaching practices and refine those skills related to literacy instruction, specifically in the area of reading comprehension. I also wanted to use statistical data to quantify and give me confidence in the validity of my findings. I decided that one indicator of my teaching success would be an improvement in my students’ reading grades. This chapter is organized into three major section. The first section provides a summary of data pertaining to each individual student, tracking their learning as the project progressed. The following section describes findings that pertain to the group of students as a whole, focusing on what I learned about improving the reading comprehension of struggling junior division readers. Finally, the last section is a summary of the findings that relate to the original research questions.
More recently, Durukan’s (2011) pre- and posttest quasi-experimental study of the effects of CIRC on 24 seventh-grade Turkish students’ academic achievement showed that they had significantly higher reading and writing achievement scores than did the 21 control-group students taught via traditional whole-class instruction. Students were randomly assigned to the control group (n = 21) and experimental group (n = 24). The study lasted for five weeks and students worked together two hours each week. During the first week, students were divided into four- to six-member mixed-ability groups. During the second week, groups prepared for their cooperative work by creating team names and slogans. During the third week, students were divided into pairs and given sentences to read. They were asked to read the sentences in pairs, correct them if necessary, and focus on pronunciation and stress patterns.

Methodology: Then students reconvened in their CIRC groups and were asked to answer two reading comprehension questions as a group. During the fourth week, students were asked to copy sentences written by the teacher to improve their writing skills. The groups then sent a copyist to the board to write down group answers. Groups were encouraged to critique each other’s work. During the fifth week, students were asked 10 questions about the reading and writing activities they had completed, and the group with the most correct answers was given an achievement certificate. To formalize the data, a Written Expression Achievement Test (WEAT) and Reading Comprehension Achievement Test (RCAT), both developed by the researcher, were used to collect data related to the study groups’ writing skills and reading comprehension skills. The RCAT test was found to be 0.79 reliable according to the KR-20 formula, and the WEAT test was found to be 0.85 reliable according to the KR-20 formula. Both groups were given the RCAT and WEAT tests as a pretest, posttest, and retention test. Both tests were scored on a scale of 25 points and translated into percentages. The experimental group’s RCAT pretest score was 13.42 (53%), their posttest
score was 23.29 (93%), and their retention test score was 19.92 (75%). The control group’s RCAT pretest score was 13.52 (54%), their posttest score was 19.95 (80%), and their retention test score was 16.86 (67%). The experimental group’s WEAT pretest score was 12.13 (49%), their posttest score was 22.54 (90%), and their retention test score was 19.08 (76%). The control group’s WEAT pretest score was 13.00 (52%), their posttest score was 20.62 (82%), and their retention test score was 17.05 (68%). Standard deviations for all were between 1.55 and 2.54.

Findings: The RCAT findings are significant for both groups regarding the common effect of being in different student groups and different measurement periods, F(2,86) = 25.216, p < 0.05. Analysis of the WEAT scores yielded similar findings, F(2,86) = 22.204, p < 0.05. In sum, although there were slightly higher arithmetical scores for the experimental group on both tests, that fact in itself does not determine the significance of the method and test-period effects. However, F-tests did find that both methods were significantly effective, and that the experimental CIRC method was more effective in increasing academic achievement. The study’s demonstration of the effectiveness of CIRC, when compared to similar studies, strengthens the external validity of the method (Calderón et al., 1998; Durukan, 2011; Stevens et al., 1987; Stevens et al., 1991). However, the article gives little detail on the content that students were taught and the CIRC activities used for instruction during the duration of the five-week study. For example, the article states “Taking into consideration various student characteristics such as sex, achievement, interest, skills, age, and culture, the experimental group was divided into 46 [sic] member groups according to CIRC technique.” The vague description of the instructional procedures, as well as the fact that the control group also had significantly increased academic achievement throughout the study, calls into question the instrumentation and, hence, the internal validity of the research methods. Because both groups had statistically significant increases in reading comprehension
and written expression, it is difficult to determine which factors of CIRC, if any, led to the slightly higher rates of achievement.

In Gocer’s (2010) study comparing the effectiveness on academic achievement of the Jigsaw technique and conventional teaching methods, Objectives: he found that the experimental group’s posttest scores increased significantly. The participants were sixty eleventh-grade students in Kayseri State High School in Turkey during the 2008-2009 academic year. The students were randomly divided into control and experimental groups and given a genre questions list test to determine their prior knowledge of literary genres.

Methodology: The experimental group was divided into six groups of five students each, which were taught via cooperative methods, and the control group was taught via traditional whole-class methods. In the cooperative groups, after students discussed what they already knew about the topic, each group sent a representative to meet with other representatives from the other groups. After these expert groups met, they sent the representatives back and Jigsaw groups were reformed. These groups were then assigned to produce a final version of their lesson product. After finalizing what they knew about the topic, students retook the genre questions list test to see if there were any gains in knowledge between the pre- and posttest.

Findings: Results were obtained from the genre questions list, and analyses were formed using the Statistical Package for the Social Sciences (SPSS) version 11.0. The data showed that the control group’s mean scores went from 57.3 to 56.4, and the experimental group’s mean scores went from 58.8 to 68.6. The statistical variances were insignificant. The t-test score between pre- and posttest results of the research group was -10.373, indicating significance at the p < 0.0001 level. The t-test score for the control group was insignificant (1.785, p < 0.05). These results suggest that study is internally valid, and the research methods
suggest that it is externally valid. The high reliability of the t-test further strengthens the internal validity. There is no mention of attrition or mortality in the study.

Şahin’s (2010) experiment Objectives: To uncover whether the Jigsaw II method would yield higher posttest and retention scores in Turkish preservice teachers found that the experimental group of Jigsaw II subjects (n = 42) had higher posttest scores than the control group (n = 38) that learned the material through traditional teacher-centered instruction. The data for the academic achievement segment of the test was obtained by using the written expression achievement test (WEAT). The questions were selected from a graduate school entrance examination and a government employment selection examination. A pilot study was first carried out with 156 Turkish language teachers in order to measure the reliability of the test. The results showed that five of the 30 questions were unreliable, and thus were removed. The scaled-down test consisted of 25 questions and was given to control and experimental groups as WEAT pre-test, WEAT post-test, and WEAT retention-test. Methodology: The groups were given an attitude questionnaire as well, but it is not relevant to this review. The participants in the experimental Jigsaw treatment were divided into six groups, and each member was responsible for taking on one expert writing task, such as correct punctuation or appropriate word usage. During the first week the groups discussed how they would study their topics, and in the second week they prepared study materials. In the third week, members met with their expert groups, and in the fourth week expert groups were given tests on their level of subject expertise. Because all of the expert groups had an achievement score over 90%, they returned back to their home groups in the fifth week and taught their own topics. In the sixth week, the topics were presented to other groups by a randomly chosen member from each group.

Findings: The mean pre- and posttest scores of the control group (n = 38) were 14.76 (SD = 2.10) and 21.79 (SD = 1.74), t = 14.940. The pre- and posttest scores for the
experimental group (n = 42) were 14.59 (SD = 2.24) and 23.33 (SD = 1.41), t = 23.498. The t-scores show statistical significance between pre- and posttest scores for both groups (p < 0.05), but were higher for the experimental group. It can therefore be said that both the teacher-centered instruction and Jigsaw II method were effective, but the scores were nonetheless more significant for the Jigsaw II group. The experimental group also had higher scores on the retention test administered five weeks later. The score for the control group (n = 38) was 18.71 (SD = 1.83), and the score for the experimental Jigsaw II group (n = 42) was 20.47, t = 4.916 at p < 0.05. These findings suggest that Jigsaw II is more effective for learning and retention than traditional teacher-centered instruction. However, because the participants in the experiment designed their own study materials, it is difficult to say how they compared to the control group materials. Little information is given for either.

Adeyemi (2008) conducted a non-randomized quasi-experimental study to investigate Objectives: the effects of an individual accountability method of cooperative learning, on social studies achievement among 150 Nigerian students ages 11-15. Methodology: The experimental group of students was put into groups of five and presented with instructional packages containing instructions and content to complete a task. The author does not specifically describe the academic content but states that it was related to social studies. The control group was taught via conventional lecture. The treatment lasted four weeks, and students were taught for three periods of 35 minutes each week. The investigator and three research assistants handled all treatment conditions. Findings: The results of the study indicated that students in the experimental cooperative learning condition showed greater improvement between the pre- and posttests. Analysis of the results using the Duncan Multiple Range. Comparison showed that students in the conventional setting had a mean score of 7.26 and students in the cooperative setting had a mean score of 11.2036. All scores were significant at p < 0.05. The instruments of measurement administered to the students all
had a split-half reliability over 78%. Split-half reliability is a measure of consistency in which a test is split into two, and the scores of each half are compared with one another. This reliability of 78% is fairly high. Pre- and posttest means were not included, costing the study both internal validity and methodological objectivity. Finally, the exact details in which the cooperative learning methods were administered are not specified, further threatening the study’s reliability, objectivity, and internal validity. The three studies on individual accountability structures and methods in this subsection found significant results for cooperative learning on academic achievement, though the study by Adeyemi (2008) was unclear as to how some the results were attained. Although two of these three studies were published somewhat recently, individualistic reward structures for cooperative learning are not as prevalent as mixed individual and group accountability methods and group-structure methods, which shall both be examined in the following subsections.

Hanze and Berger (2007) studied Objectives: compared using the jigsaw classroom technique with traditional direct instruction in a 12th grade physics class. They just eight 12th grade classes and randomly assigned them to either the jigsaw technique or direct instruction. Students were given a test of academic performance (pretest) and a questionnaire looking at personality variables (goal orientation, self concept, and uncertainty orientation). The topics (motion of electrons and electromagnetic oscillations and waves) were introduced through direct instruction in both conditions. Methodology: Students were then given the learning experience questionnaire as a pretest measures. In the second part of the lesson, the experimental group worked in the jigsaw classroom and those in the control group continued to work in traditional direct instruction. Individuals in the jigsaw class were given the learning experience questionnaire after working in the expert group and when the finished working in the jigsaw group. In the traditional classroom group, they were given the learning experience
questionnaire at the end of the lesson. A posttest of academic performance was given a few days after the learning unit.

The Independent variable was the method of instruction (jigsaw vs. direct) and the study topic (scanning electron microscope vs. functioning of the microwave). The dependent variables were the personality questionnaire, learning experience questionnaire, and academic performance. When comparing traditional instruction and the jigsaw classroom, there were clear differences in the learning experience, but there were not differences in academic performances as measured by a test of physics knowledge. Findings: Students in the jigsaw classroom did show higher achievement scores in areas that they had been assigned the expert for, but students in the traditional classroom scored better on areas that individuals in the jigsaw class had been taught by others in their group. The jigsaw classroom students had a more favorable view of the learning experience than those in the traditional instruction condition. Students in the jigsaw classroom reported stronger intrinsic motivation, greater interest in the topic, and more cognitive activation and involvement. Students were more involved and more interested in the material when in the cooperative learning setting of the jigsaw classroom. Students in the jigsaw classroom were seen as more competent, more socially related to other students, and more autonomous. There was an indirect effect on performance because students viewed themselves as more competent, but no direct impact on actual achievement.

Tan, Sharan, and Lee’s (2007) research on Objectives: The effects of GI compared to whole-class teaching among 241 eighth-grade geography students in Singapore with mixed groups of high- and low-achieving students found that high-achieving students had improved test scores, but that low-achieving students’ scores declined slightly. Seven classes from a total of two schools participated, and students were divided into a whole-class control treatment (n = 103) and an experimental GI treatment (n = 138). The method by which
students were divided was not disclosed in the article. Three teachers from the two schools that participated were trained in six three-hour workshops conducted by Dr. Shachar, which were held four months prior to the study. The researchers had five hypotheses, of which only two are relevant to this paper. Methodology: The first was that “the group investigation method will have a more positive effect on students’ academic achievement than does the traditional whole-class method of instruction” (Tan et al., 2007, p. 143). The second was that “the group investigation method will have a more positive effect on the success of lower achieving students than of higher achieving students as compared with the traditional whole-class method of instruction” (p. 143). A pilot study was conducted prior to this one, and words and ideas on the test that were commonly misunderstood were changed. The experiment lasted six weeks. The students in both the control and experimental treatments studied two units, one on pollution and one on climate change, and took an achievement test after completing each unit. A two-way ANCOVA was performed on the means, which showed a significant main effect for achievement level, $F(1,237) = 23.85, p < 0.001$. The high-achieving groups scored significantly higher than the low-achieving groups in both the experimental and control groups. There was no significant method X achievement level effect and no significant effect for method, meaning that the findings are inconsistent with both of the aforementioned hypotheses, and that GI was not more effective than the whole-class method. Additionally, although high-achieving students in the GI treatment improved their scores, low-achieving students’ scores decreased slightly. This is also inconsistent with the hypotheses that GI would have a positive effect on student achievement than traditional whole-class instruction and that GI would have a more positive effect on the success lower achieving students than higher achieving students. After the researchers cited that the students in the GI group did not have significantly lower scores than the control group, they analyzed three factors that potentially affected the lower GI scores. The first factor was student learning characteristics. After citing that most of the earlier studies on group investigation (Lazarowitz
& Karentsky, 1990; Shachar & Sharan, 1994; Sharan & Hertz-Lazarowitz, 1980, Sharan, S., Kussell, Bejarano, Raviv, Hertz-Lazarowitz, & Sharan, Y., 1985, cited in Tan et al., 2007) had significant positive effects on student achievement and that, as expected, the higher-achieving students’ scores improved significantly in both settings, the researchers used data from student surveys to determine that students were accustomed to passive learning, in which they took notes and prepared for tests. Students wrote that the GI method took too much of their time and that they did not have time to prepare for other classes and examinations. The second factor cited by the researchers was student motivation. Previous research (Johnson &. Johnson, 1985; Qin, Johnson, & Johnson, 1995; Sharan, 1980; Slavin, 1980, 1983, 1995, cited in Tan et al., 2007) had yielded positive effects on academic achievement anywhere from two days to two weeks after implementation. Slavin (1985, cited in Tan et al., 2007) later stated that cooperative learning needs to be in place at least four weeks to be effective. Therefore the researchers decided on six weeks as the duration of their study. Even so, after implementation and execution students expressed a preference for teacher-centered instruction.

This leads to the third factor cited by the researchers: school and classroom organizational norms. The authors suggested that because the teaching method was not part of the school norm, nor part of the teachers’ existing repertoire, student behavior and attitude toward it may have been affected. Because the instructional norms of the school are interconnected, the researchers suggested, a longer-term duration of the study in only one academic content area may not have a positive effect on academic achievement. Students have similar demands and expectations in different classes. Therefore, the researchers suggested that if GI is to have a greater positive effect on academic achievement, it will need to be considered in the context of a greater educational change. And if it is to be systematically researched, classroom norms of organization and evaluation must be changed.
The methods of analysis are well-founded, and ANCOVA was used to disentangle potential outside variables, meaning that the statistics themselves are reliable. The achievement results, however, are somewhat inconsistent with previous research. Shachar and Sharan’s (1994) study (reviewed above) showed that GI had a significant positive effect on gains in achievement. There is no reason to suspect that the research of Tan, Sharan, and Lee (2007) is not internally valid. Instrumentation was reliable and analyses were transparent. Interrater reliability of the test questions was sufficient, and the six-week duration of the study was sufficient for analysis without a major risk of maturation of the subjects affecting the outcome. The duration of the study, as is mentioned above, has also been proven sufficient in other contexts. Moreover, the researchers were thorough in examining confounding factors that may have affected student achievement, such as student learning characteristics, exposure to group investigation, and school and organizational norms.

In Stevens’ (2003) research on Objectives: the effects on academic achievement of implementing a student team reading and writing program (STRW) in high poverty schools middle schools in the eastern United States, with a sample size of 3,916 students (80% of whom were students of ethnic minorities), the researcher found that while the comparison students in the traditionally-taught group had significantly higher pretest scores on total reading and total language, posttest results indicated that the experimental classes had significantly higher achievement on measures of reading vocabulary, comprehension, and language expression at the end of the one-year duration of the study. Method: The two experimental schools were matched with three comparison schools on their initial achievement in reading and language arts on the California Achievement Test that had been administered by the school district. There was also an attempt to match the schools by ethnicity and socioeconomic background of the students. Students took the reading and language grammar sections of the pretest only. The pretests were given to match the initial
achievement and as a covariate to increase the power in the analyses of the outcome data. The posttest administered as part of the study was parallel in form to the pretest. During the one-year duration of the STRW program, students in the experimental group participated in a reading and writing activities, and in all of these activities they worked in heterogeneous learning teams. Within heterogeneous student teams, students were assigned a partner to work with after they had completed their activities. Individual student scores contributed to an overall team score. The reading part of the program was comprised of three main components: “literature-related activities, direct instruction in reading comprehension activities, and selection-related writing” (Stevens, 2003, p. 142). Student groups did partner reading, a variety of comprehension activities, word mastery activities, summary activities, and selection-related writing. For the writing part of the program, students were initially taught about the writing process: planning, drafting, revising, editing, and finalizing. The process was modeled and students actively participated in each step. The students worked with peers in each of the steps to incorporate the cooperative learning process into the writing process. After students learned the writing process, they had writing concept lessons and integrated English language arts lessons, both of which were designed to allow students to develop further skills to improve their writing. Findings: There were significant differences on the pretests of total reading (F = 11.2, p < 0.01) and total language (F = 54.2, p < 0.01). In both cases the comparison students had significantly higher initial achievement than the experimental students. No possible explanations were offered as to why the comparison students had higher pretest scores. MANCOVA results from the posttests indicated that the experimental classes had significantly higher achievement on measures of reading vocabulary (F = 4.32, p < 0.05), reading comprehension (F = 3.95, p < 0.05), and language expression (F = 5.74, p < 0.05).
These results support the researcher’s hypothesis that restructuring English language arts programs in high-poverty schools through the use of research-based instruction, elements of cooperative learning, and integrated reading and writing instruction can effect a significant increase in academic achievement. Stevens cited the use of cooperative learning and use of the writing process as particularly important elements in actively engaging students, which in turn causes them to take more responsibility for their own learning and leads to gains in achievement.

The findings on the positive effects of STRW on academic achievement are highly significant. The strong F-scores and large sample population add to the study’s internal validity. Although the study took place over the course of the entire year, maturation is not a threat to its validity because of the presence of a comparison group. Stevens’ (2003) research the first study ever conducted on STRW and few, if any, similar studies have been conducted since then. Therefore, it is difficult to evaluate the reliability of the findings. Despite this, overall, it is a strong study, indicating that the implementation of STRW in high poverty schools can lead to significant gains in academic achievement.

Ghaith and Bouzeineddine (2003) investigated the relationship between reading attitudes, achievement, and perceptions of cooperative learning on 111 English as foreign language (EFL) students in Lebanon. Objectives: Students completed two questionnaires and a semantic differential scale that measured their attitudes toward reading and perception of cooperative learning. They also took a pre- and posttest designed specifically to align with both their learning objectives and the study. Methodology: A week before the study, all eighth-grade students took the pretest for a duration of 30 minutes. The test had a variety of true/false, multiple choice, and short answer questions to assess comprehension of a passage, as well as questions to assess higher cognitive demands, such as making inferences and drawing conclusions. The posttest that students took at the end of the twelve-week study was
also given for a period of 30 minutes and was of the same format. Additionally, students’
attitudes toward reading were assessed prior to and at the conclusion of the study through a
ten-item survey ($\alpha = 0.63$). Students’ attitudes toward self and school were also assessed
before and after the study through the use of a seven-item scale (internal consistency = 0.70).
Finally, after participating in the study, students completed a semantic differential scale to
assess their perception of cooperative learning (internal consistency = 0.81). Both teachers
that participated were trained in the use of Jigsaw II and their average of full-time teaching
experience was 5.6 years. Findings: The teachers attended a workshop facilitated by the
researchers and developed all the learning materials themselves. Analysis of the test, attitude,
and perception data revealed several significant findings. First, the students’ reading attitude
was positively correlated with their attitude toward school and self ($r = 0.47$) and with
achievement ($r = 0.44$). Second, the students’ attitude toward self and school was found to
have a positive correlation with achievement ($r = 0.44$). Third, students’ experience of Jigsaw
II cooperative learning did not have a positive correlation with any of the other variables
measured. Of relevance to this paper are the findings that were revealed through the univariate
analysis of covariance. Namely, that male students found their Jigsaw II experience to be
more valuable than the female students $F(2, 81) = 16.99, p < 0.01$. The mean score for the
males was 31.27 (SD = 4.91) and the mean score for the females was 29.25 (SD = 4.66). Also
of relevance to this paper are the MANCOVA scores by achievement level indicating that
there was a significant difference between high- and low-achievers, $F(5, 78) = 18.04, p < 0.01$. High-achieving students had a higher mean score (22.22, SD = 3.01) than the low achieving
students (20.00, SD = 2.69), and high-achieving students were found to have more positive
attitudes toward reading than low-achieving students, $F(2, 82) = 13.82, p < 0.01$. Likewise,
low-achieving students were less positive toward themselves and school, $F(2, 82) = 9.81, p <
0.01$. The mean scores of the high-achieving students was 29.88 (SD = 3.01) and the mean
score of the low-achieving students was 26.38 (SD = 4.60). Additionally, high-achieving
students had higher reading comprehension scores than the low-achieving students, \( F(2, 82) = 77.05, p < 0.01 \). The mean score of the high-achieving students was 61.86 (SD = 7.26) and the mean score of the low-achieving students was 42.70 (SD = 6.01). However, the analysis of the data on student attitudes found that the low-achieving students were more positive toward their Jigsaw II cooperative learning experience than the high-achieving students, \( F(2, 82) = 17.24, p < 0.05 \). The mean score of the high-achieving students was 29.57 (SD = 3.77) and the mean score of the low-achieving students was 31.07 (SD = 5.73). This data indicates that reading attitudes, self and school attitudes, and reading achievement are positively internally related, meaning that students who have more positive attitudes toward reading are more likely to have more positive attitudes about self and school and are more likely to attain higher levels of academic achievement. The data also reveals that students’ perception of their cooperative learning experience was unrelated to reading attitudes, attitudes toward self and school, and reading achievement, suggesting that other individual learning characteristics such as gender and aptitude may have affected students’ perception of cooperative learning. The study contained no questionable or ambiguous language or methodology, meaning the instrumentation gives it a high degree of internal validity. The findings of the study corroborate previous work by Ghaith (2001), who found that low-achieving learners are more comfortable in a small cooperative learning group than in a more competitive whole-class situation, adding to the study’s reliability and overall external validity.

Seetape (2003) studied Objectives: the effects of cooperative learning on English reading achievement and the students’ behavior towards this learning method used in the English classroom. The samples were 29 Mathayomsuksa 3 students in Kanchanaphisek Wittayalai Uthaithani School selected by means of purposive sampling. Students were taught for eight periods, each of which lasted fifty minutes. Methodology: The instruments were English reading achievement test, cooperative learning behavioral
observation sheet, and lesson plans using cooperative learning technique. Findings: The results of the study showed that the post-test scores after learning English reading using cooperative learning were higher than the pre-test scores at the .05 level of significance. Most of the samples displayed very good behavior in cooperating in their tasks. Their cooperative behavior had increasingly developed. Some elements of poor behavior had decreased by up to 14.29 percent.

Gillies (2002) conducted a quasi-experimental study. Objectives: to determine if 88 fifth-grade Brisbane students who had been trained in cooperative learning two years earlier and who had practiced cooperative learning in the prior year would perform better in a cooperative learning situation than students who had not been trained. Gillies found that students with prior training were more task-oriented, shared more resources, and provided more solicited explanations than their untrained peers. Gillies define solicited explanations as “requests for help that were detailed and elaborate” (Gillies, 2002, p. 18). Methodology: Fifty-two children who had been trained in cooperative learning two years earlier and had participated in cooperative learning groups (with no additional training) the previous year were assigned to the trained condition. Thirty-six other children who had also participated the previous year in the untrained groups were assigned to the untrained condition. Findings: The activities required comparison, classification, imagination, inference, hypothesizing, and generalization in primary social studies topics. Researchers observed the student groups and recorded behavior states and frequency of verbal interactions. Only the behavior states observed are examined here. The four behavior states examined were cooperative, no cooperative, individual task-oriented, and individual non-task-oriented. For the researcher to determine whether there were differences between the frequency of behavior states a MANOVA was conducted. Gillies (2002) found a significant effect on student behavior states in the cooperative learning groups, with specific observable effects in the areas of
cooperation, $F(1, 86) = 31.28$, $p < 0.001$; noncooperation, $F(1, 86) = 62.11$, $p < 0.001$; and individual no task-oriented behaviors, $F(1, 86) = 17.9$, $p < 0.001$. Simply put, students in the trained cooperative groups exhibited higher levels of cooperation, lower levels of noncooperation, and lower levels of no task-oriented behavior than their untrained counterparts. These figures illustrate significant positive results for the trained cooperative condition. The strong F-scores and low p-values give the study a high degree of internal validity. The process and results are transparent and add to the study’s objectivity. The article was clearly written and there are no questionable or ambiguous aspects of it.

Somapee (2002) studied Objectives: compared critical thinking skills of students who studied Business English I at Chiangrai Commercial School using the cooperative learning method with those of students using the traditional group work method and surveyed the opinions of students toward the cooperative learning method. Methodology: A pre-test was used to assign students so both had the same level of the critical thinking skills. During the eight weeks of teaching, unit pre-tests and post-tests were given to students at the beginning and at the end of each unit respectively. After the implementation, the pre-test was assigned for them to take as the post-test. Then, two sets of averaged scores taken from the pre-test and post-test were compared by T-test. A questionnaire was then given to the experimental group to assess their opinion about cooperative learning. Findings: The results of the test revealed that critical thinking skills of students in the experimental group were higher than those in the control group. The post-test scores of students who were taught through the cooperative learning method were remarkably higher than the post-test scores of students who were taught through the traditional group work method at $p < .05$ level. Moreover, the unit post-test scores of the experimental group were higher than those of the control group as the statistical difference was significant at $p < .05$ level. The results of the questionnaire showed that students’ opinions towards the cooperative learning were moderately positive.
Meteetum (2001) conducted a case study research on cooperative learning by using the jigsaw technique with nine second-year English major students at Naresuan University. Objectives: The purposes of the study were to investigate students’ use of linguistic features in their discourse while being involved in cooperative structures, to examine the improvement in students’ grammar and competence, to investigate the quality of language input, output, and context in cooperative learning, and to study to what extent the students have positive and negative attitudes towards the cooperative learning method. Methodology: The design of the study was based on a qualitative approach. Research data came from four instruments including a grammar test, a structured field observation, a semi structured interview and a reflective journal. The results showed that there were 39 language functions and 3 social language functions used in learning sessions. All subjects had higher academic and oral achievement test scores after engaging in this learning. Moreover, the cooperative language learning also generated functional and communicative, frequent, and redundant input. The last Findings: revealed that nearly all subjects had positive attitudes towards cooperative learning in terms of oral competence, academic achievement, social skills, personal development, collaborative skills, thinking skills, and learning atmosphere.

Moryadee (2001) studied Objectives: the effects of cooperative learning using Student Team-Achievement Divisions (STAD) technique on self-efficacy and English learning achievement of prathomsuksa 5 students. Methodology: The subjects were 78 prathomsuksa 5 students of Samsen Kindergarten School. They were randomly assigned to an experimental group and a control group, comprising of 39 students in each group. The experimental group studied through STAD and the control group studied through the conventional method. This research employed the pretest/posttest control group design. All subjects were tested their self-efficacy and English learning achievement before and after the treatment. Findings: The data were analyzed by t-test. The results indicated that the students who studied through
STAD have a higher self-efficacy after the treatment than before the treatment at the .01 level of significance. The students who studied through STAD have a higher English learning achievement after the treatment than before the treatment at the .01 level of significance. On the post-test, the students who studied through STAD have a higher self-efficacy and English learning achievement than those students who studied through the conventional method at the .01 level of significance.

Perkins and Saris (2001) demonstrated the use of Objectives: the jigsaw classroom technique in an undergraduate statistics course. They noted that a part of class instruction was doing worksheets as part of an instruction. Worksheets are effective because they give immediate feedback on applying statistical ideas to sample, allow for repeated practice. Make students active over passive learners, and they can ask for help from the instructor as needed. The problem with worksheets though. One is uneven ability or readiness to complete the worksheet. One student may not have any problems while another becomes frustrated by the process. Another issue is that in statistics the worksheets require a lot of time to complete because of the many separate steps. In order to overcome these problems and still benefit students, Methodology: the authors adapted Aronson's jigsaw classroom to fit undergraduate students. Students worked in groups on two separate occasions. In the first, there were four sheets given out. Pairs of students were given the same worksheet and worked together to compute sample size. Sum of the raw scores, sum of the squared raw scores, and sum of squares for one of the four group. Each of the handouts included a blank ANOVA table and instructions with formulas as how to complete it collaboratively with three other students. Findings: The other set of worksheets was on a two-way, chi-square test of independence for three different studies. For the first study, there was an example of the computation and interpretation of chi-square. After a discussion of the first example, students received one of two worksheets that directed them through the steps for completing the chi-square procedures.
for one of the remaining designs with partial solution for each step. The handout also contained the next-to-last step for the other remaining design. It was designed that one group of students received step-by-step instruction and partial solutions for the second and a nearly complete solution for the third design and the other group received step-by-step information for the third design and the almost complete solution for the second design. Students were instructed to seek out a classmate with a complementary handout. Students were then asked to rate the benefits of the exercise using a 5-point Likert rating the exercise as 1 being not at all useful and 5 being very useful. They were asked to rate the exercise on usefulness of getting help, giving help, working with classmates, providing an alternative to a lecture, saving time, and understanding the statistical procedures. Students perceived the jigsaw procedure as being very positive especially as an alternative learning experience. Students saw using the jigsaw technique as more useful for practical purposes than for interpersonal purposes such as working with others, giving help, or getting help. Students appreciated the technique as a time-saver and viewed it as a change of pace from lectures.

3.2.2 INDIAN STUDIES


Objectives: To find out the effectiveness of web based class room instruction method in learning mathematics over the conventional method. 2. To find out the difference in achievement between higher secondary students learning mathematics through web based classroom instruction and through conventional method. 3. To study the attitude of higher secondary students towards web based classroom instruction in learning mathematics. 4. To find out the interaction pattern in web based class room instruction in learning mathematics.
5. To study the web skills of higher secondary students in learning mathematics through web based class room instruction method.

Methodology: This study followed pre-test treatment post-test equivalent two groups, experimental design. The students studying mathematics in plus two classes were taken for the study. Forty students (22 boys and 18 girls) selected for experimental group and 40 students (20 boys and 20 girls) selected for control group. The tools used in the study are; achievement test in mathematics, attitude scale for web based class room instruction, web based interaction scale and scale of web skills constructed and validated by the investigator. The significant difference between groups was studied using M, S, D, ‘t’ test, Regression analysis and F-test. The co-efficient of correlation was determined by using Pearson’s Product moment method.

1. The experimental group boys scored more than control group boys. The girls in experimental group achieved more than the girls in control group in mathematics.

2. The web based class room instruction method is more effective than the conventional method in improving the achievement of students in mathematics.

3. Boys and girls learning through web based class room instruction method differ in their attitude.

4. Mathematics & Biology and Mathematics & Computer science group students learning through web based classroom instruction method differ in their attitude.

There is significant positive correlation between achievement of students studying mathematics in Higher Secondary school and attitude, interaction, and web skills.

Sivaram R.T & Ramar R. (2012) The present experimental study was undertaken with two objectives in view: (i) To apply cooperative learning strategy in teaching and learning of English at the higher secondary level and (ii) To measure the effectiveness of cooperative
learning strategy with special reference to various categories of students. Methodology: The various steps followed in the methodology of this study are construction of research tools, identifying various categories of students, sampling, design of the study, applying cooperative learning strategy in teaching and learning of English, administration of the tools for pre-test and post-test and employing appropriated statistical techniques for arriving at scientific conclusions.

Findings: (i) There is no significant difference in the performance of the control group students between the pre-test in terms of various categories of students and in terms of the group as a whole. Though the performance is better in the post test, they could not make any significant difference. (ii) There exists significant difference in the performance of the experimental group students between the pre-test and the post-test in terms of various categories of students and in terms of the group as a whole. The achievement of various categories of students is higher in the post-test than in the pre-test. Moreover, the performance of all the categories of students in the experimental group is better than the performance of their counterparts in the control group in the post test. (iii) There is significant difference in the post-test performance between the control group students in terms of various categories of students and in terms of the group as a whole. The achievement of the experimental group students is higher than that of the control group students in the post test. (iv) There exists significant difference in the post-test performance among the various categories of students in the control group. The performance of the above average students is higher than the performance of the students of the other two categories. The gulf of difference that existed at the time of pre-test was found at the end of the post-test also. It reveals that the traditional lecture method as an instructional strategy could not enable the average students. (v) There exists significant difference in the post-test performance among the various
categories of students in the experimental group. The performance of the above average students is better than the performance of the students of the other two categories.

Baskaran, D (2011). The present study aims at findings out the effectiveness of one of the cooperative learning approaches namely Jigsaw-II with reward over the traditional method in teaching social science. Objectives: The major objective of the present study is to find out whether the jigsaw-II with reward approach is more effective than the traditional approach.

Methodology: In the present study the non-randomized control group pre-test – post-test design was adopted. The groups were formed as per the requirements of the cooperative learning approach. Findings: The results of the study are presented below in (i) the experimental group show significant difference between its pre-test and post-test – I mean achievement scores. The better performance of the experimental group is found out in the Post-test – I when compared with Pre-test performance. This reveals the effectiveness of jigsaw-II with reward approach. (ii) There exists significant difference between the post-test-I and Post-test-II mean achievement scores of the experimental group as revealed by the ‘t’ value= 2.92 which is significant at 0.01 level. It is observed that the academic performance of the experimental group is better in Post-test-I when compared with its Post-test-II performance. (iii) The experimental group differs in its Pre-test and Post-test-II performance (‘t’= 9.43, significant at 0.01 level). The group shows better performance in Post-test-II than in its Pre-test performance. This shows the effectiveness Jigsaw-II with reward approach in enhancing the academic achievement of learners.

There exists significant difference between the control group and the experimental group in their mean achievement scores as revealed by the ‘t’= 6.64, which is significant at 0.01 level. From the table, it is inferred that the experimental group excels the control group in academic performance. This reveals the effectiveness of the cooperative learning approach, namely jigsaw-II with reward approach over the traditional method of instruction. (i)
control group and the experimental group differ in their Post-test-II mean achievement scores as evidenced by the ‘t’ value at 0.01 level of confidence. (ii) The experimental group excels the control group in the Post-test-II performance. This reveals the effectiveness of the jigsaw-II with reward approach over the conventional method of teaching.

Mohanasundaram K, and Madhubala J. (2011) studied the conflict resolution skill and social maturity among secondary teacher trainees. Objectives: 1. to construct a tool to assess the secondary teacher trainee’s opinion of conflict resolution skill. 2. To analyses the opinion of secondary teacher trainees regarding the conflict resolution skill and social maturity. 3. To give recommendations based on the finding. Methodology: A sample of 40 secondary teacher trainees were taken for the study from Tamil university, Thanjavur as the control group students and 40 secondary teacher trainees from Aandavar College of Education, Nagappattinam were selected as the experimental group students. Pre-test, post-test equivalent group experimental design was adopted in the study. To Collect data “Scale of conflict resolution skill was constructed to asses the opinion of secondary teacher trainees” was developed and validated by the investigator with 15 statements of five dimensions such as 1) Institutional problem 2) Individual Problem 3) Family Problem 4) Social Problem and 5) Peer-group problem and “The comprehensive scale for social maturity” was used. Investigator made on opinion of secondary teacher trainees about conflict resolution skill with respect to gender, subject, residence and the type of family. Mean, standard deviation, graphical analysis, ‘t’ test, X2 test, ‘C’ Value, product moment correlation and regression analysis were used as statistical technique for analyzing the data collected. Findings: (i) There is a significant difference in the conflict resolution skill between the control and experimental group teacher trainees. (ii) The control and experimental group secondary teacher trainees are differ in their conflict resolution skill with respect to their gender, subject, residence and the type of family. (iii) There is a significant difference in the social maturity between the control
and experimental group teacher trainees. (iv) The control and experimental group secondary teacher trainees are differ in their social maturity with respect to their gender, subject residence and the type of family. (v) There is no significant association between the conflict resolution skill with respect to their gender, subject, residence and the type of family. (vi) There is a significant relationship between the conflict resolution skill and the social maturity among the secondary teacher trainees. The conflict resolution and social maturity are positively related. (vii) Conflict resolution technique is more effective than the conventional method in improving the conflict resolution skill of secondary teacher trainees. Conflict resolution skill of secondary teacher trainees. Conflict resolution technique is more effective than the conventional method in improving the conflict resolution skill of secondary teacher trainees.


Objectives: (1) To develop and validate an E-Content on “Solar System”. (2) To find the effectiveness of E-Content on “Solar system” in teaching beyond cognition at tertiary level. (3) To find out the differences in achievement between the teacher trainees learning “Solar system” through E-Content with respect to gender and subject of study.

Methodology: Experimental method was followed in this study. Test of ‘g’ culture fair scale 2 form B constructed by RB Cattell was administered to the B.Ed., Trainees of government college of Education, Orathanad and Arunmalai College of Education, Mannargudi. The Control and experimental group has 40 students each. Pre-test was administered to both the groups and data were collected. Then the control group was taught through conventional method and the experimental group was taught with the help of developed E-Content. Then the post test was administered to both the groups and the data were collected, the data were converted to percentage and subjected to t-test.
Findings: (i) The study indicates that the experimental group and control group trainees differ in their achievement. (ii) The male trainees in the experimental group and control group differ in their achievement. (iii) The female trainees in the experimental group and control group differ in their achievement. (iv) The experimental group and control group trainees belonging to science faculty differ in their achievement. (v) The experimental group and control trainees belonging to Humanities Faculty differ in their achievement.


Objectives: 1. To develop and validate the power point presentation in educational psychology for the teacher trainees at primary education level.  2. To fond out the differences in achievement between teacher trainees learning educational psychology through power point presentation and through conventional method.  3. To find out the effectiveness of power point presentation in learning educational psychology over conventional method.

Methodology: The pre-test, post-test equivalent group experimental design was used in this study. A sample of 50 first year D.T.Ed teacher trainees from immaculate Teacher training institute, Karaikal and 50 Teacher trainees from St. Joseph’s Teacher training institute, Poovam, Karaikal were selected for experimental and control group respectively. To collect data “Test of ‘g’ Culture fair scale, from B by R.B Cattell and A,K,S Cattell. And Achievement test in Educational psychology constructed and validated by the investigator. The significant difference between groups was studied using M, S.D, t-test, and Percentage of the mean gain scores.

Findings: (i) The experimental and control group teacher trainees who learnt through power point presentation and conventional method respectively differ in their achievement. The experimental group who learnt through power point presentation is at a higher level then the
control group who learnt through conventional method.  (ii) Science and arts group teacher trainees learnt through power point presentation and through conventional method differ in their achievement. The experimental group teacher trainees are at a higher level than the control group teacher trainees. (iii) Teacher trainees learnt through power point presentation and through conventional method differ in their ‘knowledge’. The teacher trainees learnt through power point presentation are at a higher level than the teacher trainees who learnt through conventional method in their ‘knowledge’. (iv) Teacher trainees learnt through power point presentation and through conventional method differ in their ‘under – standing’. The experimental group teacher trainees who learnt through conventional method. (v) It is found that the experimental and control group teacher trainees who learnt through power point presentation and conventional method differ in their ‘application’. The experimental group teacher trainees are at a higher level than the control group teacher trainees. (vi) Teacher trainees taught power point presentation and through conventional method differ in their ‘Skill’. The experimental group teacher trainees who learnt through power point presentation are at a higher level than the control group teacher trainees who learnt through conventional method. (vii) The teacher trainees of experimental group achieved better in educational psychology at primary education level than the teacher trainees of control group with respect to the instructional objectives. It is concluded that the power point presentation is more effective in improving the achievement of teacher trainees in educational psychology at primary education level that the conventional method. (viii) All the power point slides were attractive and informative and they were effective as there was considerable increase in the mean scores of the teacher trainees achievement in the post test.
3.3 STUDIES RELATED TO SCIENTIFIC TEMPER

3.3.1 FOREIGN STUDIES

Jenifer Reinhold and others (2010) investigated web based instruction on substance abuse and drug diversion. Objective: To develop a pilot study to assess the effectiveness of a web-based educational module on enhancing understanding of substance abuse and drug diversion, and to assess student’s abilities, and to assess students’ abilities and confidence in applying the information. Method: A web-based instructional module was presented to students enrolled in their second pre-professional year, and students were informed that it was part of a research study. Knowledge was tested using 10 pre- and post-module questions. Students were also presented with 5 survey questions assessing abilities related to the learning objectives. Assessment of the median percentage of correct responses increased from 60% (Inter Quartile Range [IQR] 20%) for the pre-module questions to 90% (IQR=10%) for the post-module questions. The median percent gain in knowledge was 20% (IQR=20%) which was significant (p<0.0001). Findings: Conclusions web-based instruction is an alternative method for engaging students in course content, and found that 59% of the pilot study group worked in a pharmacy. From the success of the pilot study, the module was implemented as an extra credit assignment in a required course to provide a foundation for developing professional skills and responsibility.

Paul Kawachi Frsa (2010) evaluated e-portfolios, convergence and open resources. Objective: To study the inter correction between the new trend in education of e-portfolios for learning communities, and the two recent trends of convergence and open education resources. Method: e-portfolios were used to promote the professional self-development of pre-service or in-service teachers. Pre-service teachers have not only used e-portfolios to develop their abilities in reflecting on given teaching principles in certain contexts, but have remarkably demonstrated their applying these skills to new contexts outside of the course.
Findings: All the in-service teachers participating in a pilot study investigating the efficacy of e-portfolios showed significant benefit with 30% of them showing excellent development. On additional benefit not covered in their study was that the e-portfolio was carry-away.

Ramos-Elizondo A.I and others (2010) made a case study to develop cognitive skills with mobile learning. Objective: To analyze mLearning resources in four courses to identify how they help develop cognitive skills in students. Methods: Focus group interviews, surveys, document analysis and non-intrusive observation were used. The data was analyzed quantitatively and qualitatively in order to link the results and the theoretical information within the two variables that guided this study: mLearning and cognitive abilities. Findings: The results show that by mLearning resources it changes the learning environment by converting any setting into a collaborative and innovative environment. Results also show that the design of mLearning resources must be based on educational theories and strategies to be effective, and also the nature of the subject and resource type are related to the developed cognitive abilities. Also it was found that although students are not aware of it, mLearning resources and the use of mile devices assists them in developing strategies that promote cognitive skills such as problem solving, decision making, critical thinking, creative thinking and melioration.

Teoh Sian Hoon and others (2010) studied the effect of an interactive courseware in the learning matrices. Objective: To integrate cooperative learning strategies, mastery learning and interactive multimedia to improve students’ performance in Mathematics, specifically in the topic of matrices. Method: It involved a quasi- experimental design with gain scores and time-on-task as dependent variables. The independent variables were three instructional strategies (CCL, CML and CCML) with academic abilities as the moderator variable. The sample for the study was 262 Form Four Malaysian Students. A courseware entitled “Matrices” was developed using Macromedia Author ware as the authoring tool. In this study,
the collected data was used to investigate the effects of the three learning strategies on the gain scores time-on-task. Based on the gain scores and time-on-task, effectiveness of the three learning strategies was discussed. Findings: This study showed that the CCML and CML strategies were superior compared to the CCL strategy; CCML strategy was produced the highest gain score. For students with low academic ability, the CML strategy was found to be the most effective strategy. The findings of this study also suggested that high academic ability students would obtain high gain scores regardless of the instructional strategies. In terms of time-on-task, students in CCL and CML strategies demonstrated significant lower time-on-task than CCML strategy.

Ada W.W.MA (2009) studied the computer supported collaborative learning in promoting life long learning skills. Objective: To re-examine the role of assessment in learning and attempt to devise a peer assessment design in a technology enhanced environment as part of the learning activities for full time teacher-educators. Method: In the three studies of this project, the creation of assessment rubrics, the submission of intra-group reflective journals, which formed the basis of the group’s growth (learning process), and the inter group review, which gained from peer’s feedback to their project presentation and report (learning product) were incorporated as the assessment measures. Findings: It was encouraging to witness that learners of the same cohort had improved their life long learning skills progressively over the period of three years by engaging in peer assessment tasks. The findings of these studies indicated that skills fostered through peer assessment were highly relevant to their workplace as teachers when teamwork, interpersonal skills and the ability of self reflection were emphasized. This study has demonstrated some good practice that supports student’s centered-learning, prepared students to be life long learners and which is suitable doe adaption to suit other contexts.
Boudge Figuerdo and others (2009) studied ICT and problem based learning as meaningful agents in competence development. Objective: TO identify the abilities that the Nursing students could obtain through independent work in a learning environment. Which makes use of digital education material, based on problems about computer networks? Method: 22 nursing students from Universidad de La Sabana which are studying the subject, “Telematica” throughout the second semester of 2007. They turn to the subject in question, now that they are allowed to see the learning environment from all sides. They also understand internships and imaginativeness of the actors who intervene. Moreover their relationships, strains and transformations. Findings: 27% of the students exceeded the expected levels in the development of given abilities. 63% reached the expected levels and only 14% reached the minimum level. These achievements were related with factors such as interchanging of knowledge, in pairs, outlines of their own thoughts, the students’ availability and attitude as the main person in the learning process. Currently, we found that the students developed other ways of learning that were not given. The environment helps to develop abilities in students, if it stimulated the process of sharing with peers.

Carolina Armijo de Vega and others (2009) investigated attitude and perceptions of students in a system engineering e-learning course. Objective: To assess teacher and students’ perception about the e-learning course experience. Method: Personalized interviews with some of the students were carried out. ATTLES and COLLES surveys were also applied to students. The teacher and students were interviewed about the advantages and disadvantages experienced over their e-learning experience. The teacher recognized the benefits of the flexibility in an asynchronous environment, the democratic values of the media which gives voice to each one in the class and the possibilities for a reflexive practice. It is also recognized the volume of work involved and the need to develop strategies to cope with numerous students. From the student point of view, the greatest difficulty detected is fear to
the unknown and the perceived workload to comply with the requirements of the course when compared to a traditional face to face course. Their lack of planning and organizing abilities are the main cause for the manifested students’ lack of interest to participate in online discussion forums. Communication strategies and adaptation strategies are proposed to involve the student into discussion and create a more comfortable and trusting environment.

Findings: It is concluded that attitudes towards thinking and learning, as measured by ATTLS, find a balance between connected knower and separate knower. The results from COLLES survey permitted to conclude that in general in the three course students perceived that they found in the course what they initially expressed as desirable.

Ed Smeets and others (2009) investigated the teaching styles of teacher educators and their use of ICT. Objective: To investigate the teaching styles of teacher educators and their use of ICT. Method: In the present study, teaching styles of teacher educators, both without and with the use of ICT, have been studied by means of a web survey. Participants were 262 teacher educators from 12 teacher training institutes in the Netherlands. Findings: The study showed that, when using ICT, there is more emphasis on knowledge construction, as compared to knowledge transfer. Several variables have been identified that are linked to the teacher educators’ teaching styles, including teacher educators’ view on modeling learning environments and on their and on their students’ abilities at autonomous and co-operative learning, the self assessment of their competencies in using ICT as a pedagogical aid, subject area, and the encouragement by management to use ICT in education.

Luis Manuel Barreto and others (2009) verified achieving new abilities with ICT, Objective: To develop a set of tools and learning environments that will allow peoples to develop, or update, their abilities. Method: The first step of the project, as it is supported in a set of Web based tools and ICT technologies, is to give their users some basic computer skills. And then, users through a cycle of continuous improvement, supported in virtual learning
environments, will be able to gain, or improve, new abilities. This continuous improvement cycle is called IPAT- Personalized Itinerary through Technological Adaption. In its first phase the IPAT will allow disfavored people like unemployed, young people with low qualifications and older actives acquire the necessary abilities to use the basic Web and ICT tools. This phase is supported in a Flyer and a CD-Rom. The Flyer shows the basic steps of turning on a computer and accessing the CD-Rom. The CD-Rom is composed by a set of interactive tutorials that, in a very clear and simple manner, will allow the user to acquire competencies in using the basic ICT tools and, also, the tools used in the project. In its second phase the IPAT will lead the user to trace its goals of career, using for that, professional profiles adjusted to the work market and to the new and emergent job types, in order to take a place in the work market. Findings: The outcomes are significant with ICT technologies.

Mai Neo and Tse-Kian Neo (2009) studied the perception of students about a multi mediated constructivist learning. Objective: To investigated students’ perceptions while working on a multimedia project that was embedded within a constructivist-based learning environment. Method: The impact was studied of using multimedia on students who have little experience with working in a problem-solving design environment. Students worked in groups and created an interactive multimedia application with Macromedia Director. They responsible for all project development decisions during their learning process. A survey questionnaire administered at the end of the project capture their perceptions. Findings: The students showed positive attitudes towards the project with respect to their learning motivation and understanding, skills and their teamwork abilities. By incorporating multimedia into a constructivist learning environment, students learned to design multimedia, as well as to experience critical thinking, creative, presentation and communication skills; enhanced motivation and understanding various levels of the subject domain. These skills would all be useful in their future undertakings. Findings provide strong support and
encouragement for Malaysian educators to incorporate multimedia technology and constructivist learning into the classrooms for the enhancement of teaching and learning.

Nagihan Yildirim and others (2009) verified the effectiveness of cooperative learning in pre service Chemistry teachers’ usage of teaching technologies. Objective: To determine pre service Chemistry teachers’ ability to use teaching technologies with cooperative learning. Method: A case study methodology was used. To collect the data, an unstandardized survey, observation notes and teacher candidates teaching material folders prepared during Chemistry Teaching Method II were used. The sample consists of 39 fifth year undergraduate chemistry teaching students attending the Department of Chemistry Education at Karadeniz Technical University in Trabzon in the fall semester of 2006-2007 academic year. The study took fourteen weeks. Findings: It was found that the study was effective for students to see their inadequacies and improves their abilities using teaching technologies during instruction.

Ranjit Kaur and others (2009) probed self-directedness through asynchronous online interactions Objective: To explore Malaysian adult learners’ self-directed abilities through one mode of computer Mediated Communication in a local private university. The areas of self-directedness explored include planning, monitoring, decision making and computer skills. Method: The sample population comprised sixteen Third Year adult course respondents (n=16) Pursuing the Listening and Speaking Course (LSC) for their Bachelor in Education (TESL) degree program. The sample within the case comprised six (n=6) case respondents and one tutor (n=1). This descriptive case study employed a mixed method approach in its data collection procedure. Quantitative data was collected through a survey questionnaire and qualitative data was obtained by analyzing threaded asynchronous online interactions (AOI), semi-structured interviews and analyzing case respondents learning logs. Findings: findings divulged that generally course respondents rated their abilities in planning, monitoring, decision making and computer skills as average (m=3.3). In depth analysis of six case
respondents' abilities also displayed average abilities (overall average score = 3.3). Microanalysis further revealed that two case respondents (R2 and R4) showed the highest level of self-directedness. This was followed with R1, R5, R3 and R6 respectively. This study also portrayed that AOI has the potential in fostering self-directedness. These findings augur well for local and global IHLS as AOI is seen as the next e-trend of the future. However, for students to fully benefit from quality AOI first, the necessary skills, attitude and knowledge must be ingrained in students. Next, an effective follow-up system backed by dedicated tutors and administrators must go hand-in-hand.

Corinne Laverty and others (2008) assessed students' teachers' knowledge of web searching. Objective: To assess the knowledge of web searching strategies of student teachers. Method: This study examined the web searching strategies of 253 teachers-in-training using both a survey (247 participants) and live screen capture with think aloud audio recording (6 participants). Findings: The results present a picture of the strategic, syntactic, and evaluative search abilities of these students that librarians and faculty can use to plan how instruction can target information skill deficits in university student populations.

Debra L. Fleming (2008) made a study to enhance collaborative learning. Objective: The primary purpose of this exploratory study is to provide insight on how to use online discussions to foster collaborative learning and how to design assessment processes to evaluate the effectiveness of those discussions. Method: This study focuses on the pedagogical role of discussion, effective practices in discussion, guidelines for creating discussions to enhance learning, and the use of rubrics for assessment and evaluation. This study also provides an overview of the pedagogy of online assessment with an emphasis on mastery learning instructional methods. Effective practices in the use of online assessment and guidelines for aligning learning objectives with the most appropriate assessment tool are also emphasized. Findings: This study concludes that using best practices in online
discussion and assessment can enhance collaborative learning which result in students having a deeper understanding of course content because of more time on task, increased motivation, more engagement, improved teamwork and interpersonal skills, enhanced critical thinking abilities, improved self-esteem and increased ownership of their own learning.

Nilgun Secken (2008) investigated the self directed learning process of pre-service Chemistry teachers through internet assisted education. This study aims to examine the effects of computer-assisted education on self-directed learning (SDL) process of pre-service teachers in teaching renewable energy and in increasing their level of knowledge. Student teachers were facilitated from computer-assisted teaching through acquiring information via the Internet. Students’ basic knowledge on energy, energy sources, efficient and productive utilization of energy was found to be quite inadequate. Internet assisted education application resulted in an improvement in their self-learning abilities and abilities to determine their needs plan their learning and apply their learning plans. Findings: The evaluation results of the Renewable Energy knowledge test of 25 questions displayed a significant increase in students’ level of knowledge at the end of the internet-assisted education. Moreover, a statistically significant improvement was observed in students’ attitudes to words computer (SATC).

Gayle Bogel (2007) probed the information literacy skills of the students. Objectives: To investigate whether the expectations for internet searching strategies outlined in provincial curriculum goals are being met in Nova Scotia schools. Method: Survey questionnaire consisting of yes/no, multiple-choice, Likert style, and open-ended responses. Setting – Twelfth-grade students from four high schools in one district in Nova Scotia. Total participants: 198. Subjects – Questionnaires were analyzed from 243 general practitioners, practice nurse and practice managers in four Nottingham primary care trusts as well as practices in the Rotherham Health Authority area. Findings: The researchers state that actual
practice in Nova Scotia schools does not reflect the standard instructional strategy of modeling as recognized by the Nova Scotia Department of Education. They feel that the results of this study show that very little modeling is being done by classroom teachers; that the modeling is instead being done by peers and family at home. This magnifies the disparity in effective skills for those who do not have Internet access at home. They also note that the goal of integrating search strategy instruction across the disciplines is not being reached. The researchers suggest two ways to offer the needed instruction: compulsory classes in information seeking for all students, or the hiring of teacher-librarians to support instruction in the schools, working collaboratively in all disciplines. Research supporting the presence of teacher-librarians in teaching effective information literacy skills, including Internet searching, is noted.

Julie Stephens (2007) investigated information literacy skills in teacher and students view point. Objective: To examine student and teacher views of information literacy skills in school assignments in order to determine: 1) To what extent did students value the use of a research model booklet PLUS (Purpose, Location, Use, Self-Evaluation)? 2) How confident were the students about doing a good assignment and did the PLUS booklet affect their confidence? 3) What benefits and limitations did students identify from individual brainstorming and concept mapping in relation to learning more about their topic and producing a good assignment? 4) To what extent did students see value in doing preliminary reading to revise their initial keywords and concept maps? 5) What reading and note-taking strategies did students adopt when using print and electronic resource? 6) To what extent (and why) did students prefer to use electronic rather than print resources? 7) What are the implications for teachers and school library media specialists (SLMS)? Method: Qualitative, action research; collaborative inquiry over fifty-two students (high school/co-educational) in the second year of high school (year 8) enrolled in a science class studying sound technology;
the school library media specialist (SLMS); science teachers of Ripon Grammar School, Yorkshire United Kingdom. Findings: The study suggested that students are capable of reflecting on their use of information literacy skills. It also indicated that students saw the value in brainstorming, concept mapping and the use of a research model such as the PLUS booklet, even though these strategies did not necessarily suit the learning styles of all students. There was overwhelming evidence that students prefer electronic resources over print resources and reasons why they prefer electronic resources were articulated. Implications for teachers and school library media specialists include: collaboration, the importance of seeking and analyzing student feedback, examining transfer of information literacy skills across subjects, and exploring student use of print and electronic resources.

Manir Abdullahi Kamba (2007) examined internet as a tool for interactive learning. Objective: TO examine the usefulness of the internet as a tool for interactive learning, teaching and research in Nigeria. Further to exhibit the impact of the internet in advancing research, teaching and learning abilities and techniques of the researchers, teachers and students respectively. Method: Survey research method was employed. Questionnaire was the main instrument utilized for data collection. Findings: The study exhibits that a number of teachers and students are aware of the benefit of the Internet as a tool for interactive learning, teaching and research; the study shows that the respondents lacked access in their schools and colleges. Only 40% of the respondents make use of the Internet for interactive learning. In addition to this 50% of the teachers only use it for interactive research. None of the teachers used it for interactive teaching.

Palmira Peciuliuskine and Marija Barkauskaite (2007) assessed the future teachers’ competence in applying ICT for development. Objective: To assess would be teachers’ competence in applying ICT and to probe the pre conditions for development. Method: survey method was employed with an administration of questionnaire over 103 subjects. Findings:
Research disclosed that would be teachers had fully mastered ordinary abilities demonstrating basic and educational competencies in ICT. The development of would-be teachers’ competence has been accepted as a permanent process starting yet before the studies at university within the process of learning informatics in forms 11 and 12.

3.3.2 INDIAN STUDIES

Balamurugan M. (2012) Studied the science attitude among the school students in Salem. Objectives: To find out the level of science attitude among the school students. To find out the significant difference among the school student’s science attitude with respect to their background variables such as (a) Community (b) Family Income (c) Family Details (d) Hobby (e) Locality of the school (f) family Occupation (g) Parental Educational qualification

Methodology: This study followed by Normative Survey Method consisting of 142 samples of school students under random sampling technique. This study delimited the Higher Secondary Course first year female students in Salem City. The tool used for this study is “Science attitude scale” constructed and standardized by “Avinash Grewal”. Findings: The results show that, the female students are equal in the favorable and unfavorable level of science attitude. They have equally scored 34.50% in their favorable and unfavorable levels of science attitude. Only 26.77% of the students have a highly favorable science attitude and 4.23% highly unfavorable science attitude. Hence, this study reveals that the equal part of the female students are influence and not influenced by the science attitude. Only on quarter of the students occupy the highly favorable science attitude and the remaining negligible percentage (4.23) of students have highly unfavorable science attitude. Among the seven background variables, the variables “family income, locality of the school, family occupation and parental educational qualifications” are influencing the science attitude of the school students whereas the variables “community, hobby, family details do not influence the school
students’ science attitude. The students’ science attitude is partially not influenced and partially influenced by the variable “family occupation”.

Jagdish Arora Prakash, P (2011) Studied the ICT enabled services and activities of the INFLIVNET. Objective: To present a fact on figure about INFLIBNET and it’s activities. Method: Meticulous case study and descriptive method. Findings: The INFLIBNET centre has taken a number on new and timely initiatives for providing effective and efficient information support to the higher education community in Indian Universities it serves. The centre has also added new dimensions to its ongoing programmes and activities that were due for a long period of time. In precise the centre has done note worthy job in the past couple of year that has duly been recognized by the academic community in India.

Hemalatha G. & Venkataraman D. (2011) studied the Indentifying learning attitude towards chemistry among higher secondary students. Objectives: The foremost objectives of the study is to explore the attitude of boys and girls towards learning chemistry at higher secondary level under the management of different schools. Methodology: The design of the study is synchronic in nature, in which data for the study has been collected by applying random sampling technique from 250 students in Chennai. The tool identify attitude of the students towards learning chemistry was validated and administered on the students –both boys and girls at higher secondary level. The collected data were scrutinized and aspirate statistical techniques were applied to identify the attitude towards learning chemistry. The data were analyzed and interpreted with regard to statistical values. Findings: (i) Sex has no significant being on attitude towards learning chemistry. However the girls had more favorable attitude towards learning chemistry than boys. (ii) Students studying in Government and Government Aided Schools differed significantly with regard to attitude towards learning chemistry. (iii) Students belonging to Government Aided and Private School differed significantly in their attitude towards learning chemistry. The same trend was seen in
the comparison between Private and Government Schools. It was found out that the managements of schools seem to have a significant bearing on attitude towards learning chemistry. (iv) The locality of school has significant bearing on students’ attitude towards learning chemistry. (v) The parental educational qualification and socioeconomic status also contribute to students’ attitude towards learning chemistry.

Ajathaswamy, A.M. (2010) analysed the internet awareness and competence among high school students and teachers. Objective: To find out the extent of awareness and competence of internet among high school and teachers. Method: Through stratified random sampling technique 100 students and forty teachers were selected for survey method. Test of internet awareness and test of competence of using internet were the tools administered. Findings: This method has significantly enhanced the competence of using internet among the teachers and students.

Amruth G. Kumar and Rajesh, K. (2010) investigated the relationship between information literacy and institutional climate perception of post graduate students. Objective: To estimate the relationship between information literacy and institutional climate perception. To estimate the relationship between information literacy and sub variable like academic climate perception, social climate perception, physical and administrative climate perception. Method: Over a sample of 400 students selected through random sampling information literacy inventory and institutions climate perception questionnaire were administered. Co-efficient of correlation suggested by Karl Pearson was employed. Findings: The study revealed that there was positive and significant relationship between information literacy and institutional climate perception. The study also revealed that positive and significant relationship between information literacy and sub variable of institutional climate perception.

Francisca, S and MaryRani (2010) investigated internet knowledge of research scholars and their usage. Objective: To study the internet knowledge of research scholars and
their level of usage. To study the significance of difference if any between scholars in internet knowledge and usage with reference to gender, location, area of specialization, research status and research degree. To study the significance of correlation if any between the above said variables. Methodology: Survey method was adopted over 200 research scholars. Internet knowledge test standardized by Dr. Rajasekar was the tool administered. Findings: There is significant difference between research scholars in internet knowledge with reference to gender. But male and female researchers significantly differ in their level of usage. There is no significant correlation between internet knowledge and usage with reference to research degree – M.Phil. There is significant correlation between internet knowledge usage with reference to research degree – Ph.D.

Neeraj Kaushik and Anita Sharma (2010) assessed computer and internet awareness in school going students. Objectives: To assess the computer and internet awareness level among the students of class IX and X. Methodology: Exploratory cum descriptive in nature through survey method by administering questionnaire. The sample size was 100 by random selection. Findings: (i) 62.7% had computer already, (ii) 46.6% had exposure to computer, (iii) 26.6% had known various applications, (iv) 34% had email I.D, (v) 100% perceived that internet is informative.

Saikumari, K (2010) studied computer phobia of IX standard students and their attitude towards educational usage of computers. Objectives: To investigate the level of computer phobia among IX standard students. To investigate the computer phobia of IX standard students in terms of locality, age, and type of management school. To investigate the attitude of IX std students towards computer usage in education. Methodology: the investigator used random sampling technique for selection of students from three types of schools Government, Aided and Private. The sample size was 310. The sample included boys and girls of the age group 13-15 with both urban and rural back ground. Computer
phobia scale developed and standardized by Rajasekar and Vaiyapuri (2006) was used. Findings: The investigator found that the factors like, gender, locality of the school and type of management of school do not influence the computer phobia of IX standard students and their attitude towards computer usage in education. The study reveals that the role of teachers is significant in helping the students get rid of their computer phobia. So the teachers must be given computer literacy to guide their students.

Sibichen K.K and Annaraja P. (2010) assessed teacher trainees’ computer competency and their technology use in classroom teaching. Objectives: To find out the techno pedagogical skills, skills in learning, preparing lesson plan, preparing teaching materials, implementing instructional strategies, communication, evaluation and guidance of the secondary teacher education students. Methodology: Survey method was adopted on the sample of 75 B.Ed. students of Mahathma Gandhi University, Kottayam through stratified random sampling technique. The sample consist of 37 men and 38 women students. Techno pedagogical skill assessment scale developed by the investigator was the tool employed. Findings: t test result revealed that there is significant difference between secondary teacher education student who have attended computer course and who have not attended computer course in their skill in learning and techno pedagogical skills.

Rajasekar. S and Vaiyapuri Raja. P (2007) Studied higher secondary school teachers’ computer knowledge and their attitude towards computer. Objectives: To study the level of computer knowledge of teachers. To study the teachers’ attitude towards computer to study the significance of the difference between the sub-samples of the teachers in respect of their computer knowledge and their attitude towards it. To study the nature of the relationship existing between the teachers’ computer knowledge and their attitude towards computer. Methodology: Survey method, Cluster sampling technique has been used in the selection of the sample of as many as 670 teachers working in higher secondary schools situated in the
Cuddalore district of TamilNadu, India. Findings: The present study has revealed many interesting findings. Viz., the majority of teachers working in the higher secondary schools, situated in the Cuddalore district of TamilNadu, India, belong to the low level of computer knowledge and majority of teachers have a relatively favorable attitude towards computer. This reveals that the computer knowledge of the teachers needs to be improved.

3.4 STUDIES RELATED TO CREATIVITY

3.4.1 FOREIGN STUDIES

Ozgul keles (2012), Studied the Elementary Teachers’ View on Mind Mapping Objectives: (i) The teachers were primarily instructed about the application of the mind mapping technique. (ii) Using mind mapping in instruction helps teachers improve their instruction, planning and evaluating lessons and makes the lecture more entertaining. (iii) The technique can be suggested to extend by analyzing its relation with different variables like different lessons and participants. (iv) Students understood the subject and they could construct an appropriate structure for the new information by examining their mind maps. (v) When the features of mind maps are taken into consideration, it is proposed that using mind maps in the different lessons might be effective tool.

Methodology: The study group of the research was composed of 24 elementary teachers(18 females; six males) experience periods in their job between two and 21 who were enrolled in a “Teaching Thinking Science Consulting Course”. In the implementation phase of the study, the teachers were primarily instructed about the application of the mapping technique. Firstly, mind maps were presented in details to the teachers participating in the study. Then, a mind map was prepared with the participants stating one day’s plan. After preparing sample map, each participant was asked for to prepare a mind map presenting him/her individually. Participants were enabled to analyze each other’s mind maps by presenting the studies carried
out on mind maps on the board. In the interviews open-ended six questions were asked to teachers about mind mapping and the use of this technique in the classroom. Interviews were analyzed using qualitative research methods.

Findings: The data gathered indicated that all the teachers participated in the study believe that mind maps are effective tools in learning and improving students’ creativity and in providing permanent learning. Participants emphasized that it is a technique that appeals visual intelligence, gives students chance to express themselves freely and that is easily applicable. They also expressed that this technique can be applied in all grades of learning and in early years of primary education it is more appropriate to use mind maps than concept maps. Among the difficulties in application of this technique, drawing pictures and correlating concepts can be counted. Relevant literature studies support these findings (Balim, Aydin & Evrekil, 2006; Goodnough & Woods, 2002; Williams; 1999; Taliaferro, 1998).

Graphic organizers assist learning by providing an opportunity for visual stimuli, assessment, checking understanding, elaboration, note taking, summarizing, illustrating sequence of events, and other creative ways of instructing (Gregory & Chapman, 2002; Trevino, 2005; Bromley, Irwin-Devitis & Modlo, 1995). There are studies showing that mind maps contribute to longer retention of the information through mind maps (Akinoglu & Yasar, 2007; Buzan, 2005); help students to see the connections among the pieces of information (Evrekli & Balim, 2010; Evrekli, Balim & inel, 2009); in light of these findings, mind maps are thought to be useful for teachers while teaching science concepts.

Mind mapping improves students’ skill of thinking and reveals their creativity by using different color and shapes and affects them positively. Teachers can help students to improve thinking skills and creativity by using mind mapping together with the other techniques in accordance with the philosophy of constructivist approach. An important implication of this
study is that there is a need for teachers to know how to teach mind map construction and to associate the mind maps into their lessons. The present study is limited to the elementary teachers. In order to extend the use of mind mapping technique, this technique can be offered to teachers from different branches.

Joran Beel, Bela Gipp (2011) Studied the link analysis in mind maps: A new approach to determining document relatedness. Objectives: Mind mapping is a common method to structure and visualize ideas, manage electronic literature and to draft documents. Some users do link in their mind map to external documents such as PDFs or websites. Some even cite scholarly literature, for instance by adding BibTex keys to a mind map’s node. We proposed to analyze these links and references to determine the relatedness of those documents that are linked in the mind map.

In a brief experiment we researched link analysis respectively citation analysis, if applied to mind maps, is suitable to calculate document relatedness. The basic idea is that if two documents A and B are linked by the same mind map, these documents are likely to be related. This information could be used by item-based document recommender systems.

The results of our experiment support our ideas. It seems that link analysis applied to mind maps can be used for determining the relatedness of documents and therefore for improving document recommender systems.

Methodology: Our intention was to conduct an experiment to obtain first indications if Link Analysis in Mind Maps (LAMM) might be suitable for determining research paper relatedness. Two assumptions were researched:

1. Two research papers A and B are related if at least one mind map links them both.
2. Two research papers A and B are more highly related the more closely they are linked within a mind map.
As part of the experiment, five mind maps were analyzed which were originally created for drafting research papers, respectively Masters Theses 3. That means each of the mind maps links at least to a few PDF files representing academic articles. From each mind map, links (respectively citations) to three articles were extracted and pairs were built (see Figure 2 for illustration). The first pair was built from the first and second link in a mind map. Since the distance between them was low, we expected this pair to be ‘highly related’. The second pair was built from the first and last link in the mind maps. Here, the distance between the links was high. Accordingly, we expected the corresponding articles to be less closely related.

To test our assumptions, titles and abstracts of the linked PDFs were extracted. Since five mind maps were analyzed, five pairs with low distance (expected relatedness = (very high) and five pairs with high distance (expected relatedness = low) existed. In addition, five ‘control pairs’ of papers were created. We created these pairs in a way that they should appear as not being related to each other at all.

All pairs were shown to five participants and the participants had to rate the relatedness of the pairs on a scale from 1 to 5 (1 = not related, 5=highly related). For evaluation, ratings were painted in a scatter plot for each participants as well as the overall rating (mean and median). A more detailed statistical analysis was not considered necessary, since the graphs showed quite clear results and the amount of data was too little for extensive statistic analyses.

Findings: On average (mean), those pairs linked closely together in the mind maps were considered significantly more often (highly) related than those pairs not linked closely together. The control pairs, which were not linked by any mind map, were all rated as not related, on average.
Some outliers exist: On average, pair 2 in mind map 2 was considered higher related than pair 1 in mind map 2. In addition, pair 2 of mind map 3 and pair 1 of mind map 5 were rated as almost not related. However, this is not surprising since maps are usually used for drafting a paper and therefore variances are to be expected.

Grace Catherine Wanja Ndeke (2008) Studied the effects of gender, knowledge and learning opportunities on scientific creativity amongst form three biology students in Nakuru district. Objectives: Geology Education aims at enabling the learner to develop and use scientific creativity skill as well as acquire biological knowledge, to participate in the development of Kenya's economy. Adequate preparation of biology students in the subject in secondary schools is therefore essential. In addition, the level of scientific creativity among biology students and factors influencing its development need to be understood. However, few studies have been done in Kenya with regard to this skill. Therefore, the purpose of this study was to investigate the level of scientific creativity and the effects of gender, knowledge and learning opportunities on scientific creativity amongst form three biology students in Nakuru district. Methodology: The research methods for the study were a cross-section survey and a case study. The population of the study consisted of all form three biology students in public secondary schools in Nakuru district. A sample of eight schools with a total of 363 students was selected from the population using stratified random sampling technique. Three schools from the sample were used for the case study design. The researcher administered biology achievement test and biology scientific creativity test instruments to the students and also conducted classroom observations of biology lessons in the sampled schools. The test items were pilot tested in two schools in the district for validation. The pilot schools were not involved in the main study. Findings: Data analysis was done using both qualitative and quantitative methods. Quantitative data was analyzed using Pearson Product Moment Correlation Coefficient, chi-square, t-test and One way ANOVA. Statistically
significant findings were tested at 0.051 level. Scientific creativity test and the classroom observations were analyzed qualitatively. The findings of this study indicated that the general level of scientific creativity in biology was low. The findings also indicate that the learning opportunities provided during the biology lessons are inadequate for effective acquisition of scientific creativity skill. The findings also indicate that the level of scientific creativity was gender dependent in favour of boys and also dependent on school category. All aspects of scientific creativity were also found to have a relationship with gender and school category with the exception of planning. A significant difference in performance in the biology scientific creativity test by gender and school category was also identified. The findings further suggest that scientific creativity is also knowledge dependent. The implications are discussed. Recommendations on how to improve scientific creativity skill in schools are given.

To m o. A . Illa (2006) Studied the effects of concept mapping strategy on students' creativity in secondary school physics in nyando district, kenya. Physics plays a major role in the development of creative efficacy. One of the main Objectives : the secondary school physics syllabus in Kenya is to inculcate creativity among the learners. However, the responses of students to Kenya Certificate of Secondary Education (KCSE) examination questions over the years show a poor development of creative thinking. This is probably due to, among other factors, the use of conventional teaching strategies. This study covered two creative abilities, namely; recognition of relationships and planning for scientific investigation. The study focused on the topic 'energy' which is central in the physics syllabus being closely related to other topics like electricity, magnetism, work, power, sound, heat, machines, force and radioactivity. Various studies have shown that the concept mapping strategy has positive effects on students' achievement and attitude. However, no investigation has been done to check its effect on scientific creativity especially in Kenya. Methodology:
This study was designed to investigate the effects of concept mapping strategy on students' creativity. The study employed a quasi-experimental approach adapted from the Solomon Four-group experimental design. The population for the study consisted of Form Three physics students in Nyando district. A sample of 124 respondents in four schools took part in the study. Purposive sampling was used to select schools with at least thirty students in the Form Three physics class. This was followed by a random selection of the four schools used in the study. Two instruments namely; Physics Creativity Test (PCT) and Concept Map Assessment Test (CMAT) were used to assess the students' scientific creativity level and to evaluate the quality of the concept maps developed by the students, respectively. Both quantitative and qualitative data were generated. The data collected were therefore analysed using both descriptive and inferential statistics. Findings: The t-test was used to check the effects of the pre-test, the Pearson Product Moment Correlation Coefficient and Analysis of Variance (ANOVA) were used to test the hypotheses at a significance level (alpha) of 0.05. Results of the study showed that the students who used the concept mapping strategy obtained higher scores in the physics creativity test than those who did not. The findings are of great benefit to curriculum developers, policy makers, science education teachers and physics teachers as they seek measures that facilitate creative thinking among students.

3.4.2 INDIAN STUDIES

Elizabeth Joshua, & Jayasree P. (2012) Studied Scientific Creativity and Scientific Reasoning of Higher Secondary School students. Objectives: To study the level of Scientific Creativity of students at higher secondary level. To study the level of scientific reasoning of students at higher secondary level. To explore the relationship between scientific creativity and scientific Reasoning of students at higher secondary level, on the basis of (a) Gender (b) Locality  (c) Type of management of school. Methodology: Normative survey method was selected for the present study. The investigator collected data from XI standard students of
Kottayam District using Scientific Creativity Test and Scientific Reasoning test. The present study consists of a sample of 300 students in Kottayam District. A test of scientific creativity was constructed and standardized by the investigator and validated with the help of experts. The tool is based on five components namely Fluency, Flexibility, Originality, Elaboration and Redefinition and sensitivity to problems. A test of Scientific Reasoning was prepared and standardized by Vishwanadhan Nair and Sobhana, Kerala University, Thiruvananthapuram (1993) was used to measure the Scientific Reasoning of the sample. The study used the statistical techniques such as Arithmetic Mean, Median, Standard deviation, Karl Pearson’s Coefficient of correlation and Significance of correlation Coefficient. Findings: There is significant relationship between Scientific Creativity and Scientific Reasoning of students at higher secondary level, on the basis of (a) Gender (b) Locality (c) Type of management of school.

Ronu Thomas & Latha R. (2012) studied Promoting Scientific Creativity in Senior Secondary school students through Guided Discover approach. Objectives: To compare the Scientific creativity of experimental group and control group with regard to Gain in performance. Methodology: The present study is experimental in nature. Hence researchers have adopted the pre-test post-test non equivalent design. The population selected for the present study includes all the XII Science stream students who follow kerala state syllabus, Palakkad District. The students from two divisions of standard XII of M.N.K.M.G.H.S.S., Pulappatta, Palakkad were selected as sample (Sample size, n=40). Standardized test for Scientific Creativity by Rosamma Philip (2008). Findings: The major findings that have emerged from the study is When the gain in performance of the pupils in experimental and control group were compared, in the case of scientific creativity the difference between the means was found to be significant. The experimental group was found to be superior to the control group (‘t=2.982; p<0.01). The conclusion is that the experimental group is far
outweighed the control group in performance. So guided discovery method is more effective than the conventional method in enhancing scientific creativity among senior secondary school students.

Ramakrishan K.S & Thenmoahi C. (2012) Studied the Gender differences in Creativity among secondary grade teacher trainees. Objectives: Education is fulcrum upon which hangs the peaceful evolutionary transition of society. It plays a vital role in building a society. The term creativity is widely used with reference to the creative people, the creative process, even a creative environment. Creativity is the ability to produce work that is both novel and appropriate. However, environmental factors will interact with individual differences and influence the creative process. Methodology: This study was undertaken to find out the significant differences in creativity among the student teachers. The Baquer Mehdi’s creativity tool was used for the study. It consists of various dimensions such as thinking creatively with words, problems, novel use of things, making things more interesting and useful, etc. Originality, flexibility and fluency are considered various dimensions of creativity. Age, gender and type of school are taken as the category variables. A sample of 225 students teachers studying in and around Chennai were taken as the sample. Stratified Random Sampling process was used. Findings: (i) In fluency level there are significant differences among men and women. Male members’ scores are higher than the scores of female teacher trainees. (ii) In flexibility, there are significant differences’ scores are higher than the scores of female teacher trainees. (iii) It was found that a significant difference occurred in the originality of men and women teacher trainees. (iv) It was found that there was no significant difference in the fluency and originality levels of teacher trainees studying in Government and Government Aided Institutes. In the case of flexibility level significant difference was found among the teacher trainees. (v) It was found that there was no significant difference in the flexibility and originality levels of teacher trainees in low age-
group and high age group. In the case of fluency level significant difference was found among the teacher trainees.

Anil Kumar Nautiyal & Prabha Negi (2011) Studied A Comparative Assessment of the Creativity in Adolescents Across two Categories of Schools in Pithoragarh, Central Himalaya. Objectives: To the adolescent students of Class XII attempts a comparative assessment of creativity (i) in girls versus boys, (ii) in students enrolled in government run schools versus enrolled in private school, and (iii) across different economic groups of students. Methodology: Adolescents, in the age group between 15 and 18 years, and studying in the 12th standard were selected across township of Pithoragarh, Uttarakhand. Altogether 178 adolescents, represented by 103 boys and 75 girls were selected randomly. Measurement of potential creativity was done through Passi tests creativity. Findings: In an overall appraisal of difference between sexes in ability, achievement, and readiness, the differences were very slight, and certainly not sufficient to warrant the fact that creativity differs across the sex. However, a sharp difference is conspicuous in the functioning of creativity of the adolescents, enrolled in private run with those enrolled in government run schools, with creativity level being significantly more in adolescents enrolled in the former. Creativity shows a positive correlation with the socio-economic status of the family, irrespective of the sex of the student. It is strongly felt that if the potential of creativity is to be harnessed, a requisite motivating environment, which boosts up their self-concept and achievement motivation, remains obligatory.

Harish. G.C. (2011) studied the impact of integrated critical thinking skills on achievement in mathematics of secondary school students. Objectives: To study the impact of integrated critical thinking skills on achievement in mathematics. To determine the relationship between the integrated critical thinking skills and achievement in mathematics with respect to gender. To find out differences in the critical thinking skills and achievement
scores based on gender. Methodology: The Randomized pretest, posttest control group design was used with a purposive sample in the form of intact sections of class 9 of the same school. The sample of the experimental group 45 boys and 25 girls, control group boys 45 and girls 25 at the final stage of experiments. The researcher has developed the achievement test based on standard 9 mathematics content followed by test in the study, viz. usual mathematics achievement test and achievement test based on integrated critical thinking skills components. The final version of the tool having test-1 consisted of 25 items and test-2 consisted of 30 items. These tools were constructed and their reliability and validity were established. Findings: (i) There is a significant difference between the posttest achievement of Control and Experimental groups. (ii) There is no significant difference between the Mean scores of boys and girls in the posttest achievement. (iii) There is a significant interaction between group and gender on posttest achievement. (iv) There is a significant difference between the Mean scores of group and gender in their posttest achievement with respect to total integrated critical thinking skills. (v) There is a significant interaction between group and gender on total integrated critical thinking skills on achievement after the intervention program.

Gakhar S.C & Sushma sood (2003) studied Creativity, Problem Solving and Personality. Objectives: To study and compare separately the relationship between creativity, problem solving ability, personality characteristics and mathematical achievement of students of residential and non-residential senior secondary schools. Methodology: Descriptive survey method was employed in the present study. Proposed study was conducted on a representative random sample of 460 students of 10th class (260 from residential and 200 from non-residential schools of Chandigarh). Tool used (i) problem solving Ability test (standardized by investigators). (ii) Verbal Test Creativity Thinking (Baquer Mehdi, 1985). (iii) sixteen Personality Factors Questionnaire (kapoor and Tripathi, 1982). ( iv) Mathematical
achievement of students was taken in terms of their mathematics marks of 10th class of CBSE Examination.

Findings: (i) Mathematical achievement has significant relationship with the problem solving ability of students of residential and non residential schools. (ii) Mathematical achievement has significant relationship with the personality characteristics of students of residential and non residential schools. (iii) Mathematical achievement has significant relationship with the creativity of students of residential and non residential schools.

3.5 INSIGHT GAINED FROM THE REVIEW OF RELATED LITERATURE

The review of related literature reveals that some studies were reported related to achievement in science subjects, scientific temper, creativity and small groups learning method for learning of subjects. No studies were reported as the teaching of science through small groups learning method. So the present study has been taken by the investigator.

3.6 CONCLUSIONS

The small groups learning strategy and Achievement, Scientific temper and Creativity of Review of related literature for Foreign and Indian studies followed in the present investigation were discussed in this chapter. The methodology of the study and presented in the next chapter.