CHAPTER – 2

REVIEW OF RELATED LITERATURE

The study of related literature is very important for any research. The phase ‘review of literature’ consists of two words, Review and Literature. The term ‘review’ means to organize the knowledge of the specific area of research to evolve an edifice of knowledge to show that the proposed study would be an addition to this field. In research methodology, the term ‘literature’ refers to the knowledge of a particular area of investigation of any discipline, which includes theoretical, practical and its research studies.

According to Wikipedia an Encyclopedia (2012) “A literature review is a body of text that aims to review the critical points of current knowledge including substantive findings as well as theoretical and methodological contributions to a particular topic.” According to Moully (1984) the review of the related literature is essential to the development of the problem and to the derivation of effective approach to its solution. The study of related research work is very important to make the research more effective. The outputs, gain knowledge and techniques used in previous related literature prove useful in research work. Therefore, for each study it is very important to observe the previous studies and related literature. This section has the details of related literature for the present study included theoretical discussion. Uchat et al. (1998) narrates that, “Ideal situation is that, the researcher has to prepare the review of the related literature before starting his work study, then only the basement of the work-study can be prepared”.

Review of the related literature allowing the researcher to acquaint himself with the content (in this research constructivism) and past researches in the field in which he is going to conduct his research.

In this chapter, the researcher has divided the review into two major aspects. In the first part, philosophical review of the content related to the Constructivism and CIP is explained and in the other part, Analytical review of the past researches has been made. After that, the matter of the foundation and significance of the present study of the present study is presented.

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2.1 PHILOSOPHICAL REVIEW OF THE CONTENT

With the help of the theoretical review of the content, the Researcher acquaints the reader with different dimensions of particular content related with the problem selected by the researcher. As per Davies (1971), “The aim of the philosophical review of the content is to divide the learning (Teaching) material in their factors or elements and synthesize them in their order logically”. As per Joshi (1994), “Analysation of the content with reference to one syllabus of the only one subject, is called philosophical review.

Joshi (1994) suggests the following points required to be considered for the philosophical review.
1. To know the dimensions of the selected content for philosophical review.
2. To prepare the questions regarding the content for philosophical review.
3. To select references for the review.
4. To get the answers of the selected questions from the references.
5. To analyze the collected data with reference to the particular field of the content numerically.

For philosophical review, researcher has used preliminary, secondary, primary and supplementary references to get the answers of the following questions.

1. What is Constructivism?
2. What is Constructivism philosophy?
3. What is the definition of Constructivism?
4. What is the origin of constructivism?
5. Which are the Basic ideas of constructivism learning theory?
6. Why Is Constructivism Important?
7. How Constructivism Impacts Learning?
8. Which Constructivist Learning Design can be used for constructivist teaching?
9. What is the difference between Traditional and Constructivist Classroom?
10. Which Teaching- Learning Process can be used for Constructivism?
11. What is the contribution of constructivist articles in educational technology journals?
12. Which constructivist model can work best in the science classroom?
1. What is Constructivism?

To implement inquiry techniques effectively the teachers should not see the student as a mechanical object but an organic individual that individual actively construct his/her learning based on prior experiences and using accepted models in a particular discipline constitute the major aspect of constructivism. This is the bedrock of this study. Constructivists believe that the new idea is not imposed on the learner. The learner is actively re-structuring his knowledge on the bases of past and present experiences. Students’ active involvement is emphasized in Constructivism; the knowledge is then rooted into their memory.

Students are not empty vessels that we can pore with our knowledge. Knowledge is situated inside the sole that they themselves have created actively (Bhogayata C., 2003). Teaching is not an easy task. Knowledge has to be generated by the students. Teacher can only facilitate students in doing so. The role of a teacher is as a facilitator. Knowledge should construct in student’s mind. Construction of knowledge is affected by various factors. Constructivist teaching makes student’s learning more meaningful and long lasting because it includes hands on experience on topic, collaborative learning, raising questions, and find their solutions, peer learning, acquiring new ways and methodologies, make student capable to develop their own pattern of learning, healthy discussions, compare and contrast methods, case study methods, etc.

2. What is Constructivism Philosophy?

The philosophy of constructivism evolved from dissatisfaction with traditional Western theories of knowledge. As such, it contrasts sharply with objectivist epistemology and positivism (Crotty 1998; Hendry, Frommer, and Walker 1999; Glasersfeld 1995). In contrast to the objectivist notion of objective truth and meaning inherent in objects, independent of any consciousness, constructivism postulates that knowledge cannot exist outside our minds; truth is not absolute; and knowledge is not discovered but constructed by individuals based on experiences (Crotty 1998, 42; Fosnot 1996; Hendry, Frommer, and Walker 1999). Constructivism replaces the traditional conception of truth as the correct representation of an external world with the concept of viability, meaning that descriptions of states or events of the world are relative to the observer (Glasersfeld 1995, 8). The constructivist perspective,
therefore, posits that knowledge is not passively received from the world or from
authoritative sources but constructed by individuals or groups making sense of their
experiential worlds (Maclellan and Soden 2004). Constructivism advances meaning-
making and knowledge construction as its foremost principles (Crotty 1998; Fosnot
1996; Phillips 1995). It views knowledge as temporary, nonobjective, internally
constructed, developmental, and socially and culturally mediated (Fosnot 1996).
Individuals are assumed to construct their own meanings and understandings,
and this process is believed to involve interplay between existing knowledge and
beliefs and new knowledge and experiences (Richardson 1997, 2003; Schunk 2004).
This view of meaning-making through previously constructed knowledge implies
that:

- Learners are intellectually generative individuals (with the capacity to pose
  questions, solve problems, and construct theories and knowledge) rather than
  empty vessels waiting to be filled.
- Instruction should be based primarily on developing learners’ thinking.
- The locus of intellectual authority resides in neither the teacher nor the resources,
  but in the discourse facilitated by both teachers and learners (Maclellan and Soden
  2004).

The basic assumptions and principles of the constructivist view of learning can
be summarized as follows:

- Learning is an active process.
- Learning is an adaptive activity.
- Learning is situated in the context in which it occurs.
- Knowledge is not inherent, passively absorbed, or invented but constructed by the
  learner.
- All knowledge is personal and distinctive.
- All knowledge is socially constructed.
- Learning is essentially a process of making sense of the world.
- Experience and prior understanding play a role in learning.
- Social interaction plays a role in learning.
- Effective learning requires meaningful, open-ended, challenging problems for the
  learner to solve. (Boethel and Dimock 2000; Fox 2001)
As an educational constructivist, the constructivism is a trend, discourse and theory that was emerged and disseminated during the period between 1980 and 1990 (Welsch, Jenlink, 1998). This term tells that the information is constructed by the student. That is to say, the individual does not adopt the information as it is, he restructures his own information. He adopts the information he is provided in combination with his own information under his own conditions (Özden 1999). The constructivism describes structuring of the reader the mental presentation in an active manner by means of combining textual information with the new information (Spivey, 1987).

In 18th Century, the philosopher Giambatista Vico is in fact defends with his statements of “the one who knows something also provides an explanation”. Emmanuel Kant further developed the same idea and said that the human being was active in receiving the information, establishing its relation with previous information and making its own information. Scientists like John Dewey, Piaget and Vygotsky had contributed to the structuralism in the sense of shaping the construction with their works (Özden, 1999). The constructivist philosopher is closely related with the idealist philosophers. The constructivists argue that our information in fact reflect our opinions. They also contend that it is not possible to determine whether the observers monitor the same objects or not. They hold that the experience and opinion are in fact the determinants of how to sense the world. The truth is an individual structure. We hold the truth as what is “beneficial” for us. For majority of the constructivists, the ideas are not taken as completely wrong or right. This is mainly because, it is not possible for everyone to be in accord with what is the nature of the truth. The constructivist prefers to speak of the interests of the majority of the scientific society rather than (the “truth”) what is “true” (Colburn, 2000). The principle rule of the constructivism is that; it has been not withstanding argued since Ancient Greece – by making attributes to Socrates dialogues that helped the construction of innovative understanding of the students as opposed to more direct and didactic context of learning it is generally accepted that it is daring to announce that it is a separate school of the basic epistemological trends. As Howe and Berv explained “The constructivist should propose something deeper than that, something which is deeper than the epistemological point of view. Otherwise, it would be abandoned since they were useless. (Stemhagen, 2004).
The individual construct the truth by their communication and interactions with their social and physical environment (Siviş, 2002). Going back to the short history of the constructivism, Howe and Berv were followed by John Locke’s empiricism and René Descartes’ rationalism. For Descartes, rational activity enables the information; this is in fact revelation of what has been already there, a distinct form of the information (Stemhagen, 2004). The structuralism is a perspective that emerged in evolutionary and informatory psychology, whose prominent figures include Bruner, Vyogotsky, Kelly (1991) and Piaget (1977). To Piaget Inhelder (1969), the structuralism asserts that each individual creates a mental world in his individual informatory process. These processes are in the individual’s discretion, the integration of the information (or its meaning) with preassembled diagrams (assimilation) and modify the diagrams to suit with the frame (installation) (Narrated by Young, Collin, 2003).

Constructivism is a view of learning based on the belief that knowledge isn't a thing that can be simply given by the teacher at the front of the room to students in their desks. Rather, knowledge is constructed by learners through an active, mental process of development; learners are the builders and creators of meaning and knowledge. Constructivism draws on the developmental work of Piaget (1977) and Kelly (1991). Twomey Fosnot (1989) defines constructivism by reference to four principles: learning, in an important way, depends on what we already know; new ideas occur as we adapt and change our old ideas; learning involves inventing ideas rather than mechanically accumulating facts; meaningful learning occurs through rethinking old ideas and coming to new conclusions about new ideas which conflict with our old ideas. A productive, constructivist classroom, then, consists of learner-centered, active instruction. In such a classroom, the teacher provides students with experiences that allow them to hypothesize, predict, manipulate objects, pose questions, research, investigate, imagine, and invent. The teacher's role is to facilitate this process.

Piaget (1977) asserts that learning occurs by an active construction of meaning, rather than by passive recipience. He explains that when we, as learners, encounter an experience or a situation that conflicts with our current way of thinking, a state of disequilibrium or imbalance is created. We must then alter our thinking to restore equilibrium or balance. To do this, we make sense of the new information by
associating it with what we already know, that is, by attempting to assimilate it into our existing knowledge. When we are unable to do this, we accommodate the new information to our old way of thinking by restructuring our present knowledge to a higher level of thinking.

Similar to this is Kelly's theory of personal constructs (Kelly, 1991). Kelly proposes that we look at the world through mental constructs or patterns which we create. We develop ways of construing or understanding the world based on our experiences. When we encounter a new experience, we attempt to fit these patterns over the new experience. For example, we know from experience that when we see a red traffic light, we are supposed to stop. The point is that we create our own ways of seeing the world in which we live; the world does not create them for us.

Duffy & Cunningham (1996) present two basic principles that typify constructivist instruction: (a) learning is an active process where knowledge is constructed and not acquired, and (b) the process of instruction supports knowledge construction rather than communicating that knowledge. According to the constructivist view the learner is an active organism, who engages in the meaning making and sense seeking, rather than a passive one that responds to stimuli (Perkins, 1992). Moreover, constructivist learning is characterised by involving learners in situated and authentic activities that reflects the real world (Duffy & Jonassen, 1992). Learning is active (manipulative/observant), constructive (articulative/reflective), intentional (reflective/regulatory), authentic (complex/contextualized/realistic), and cooperative/collaborative/conversational/socially negotiated (Bednar, Cunningham, Duffy, & Perry, 1992; Driscoll, 2000; Jonassen, Howland, Moore, & Marra, 2003; Schunk, 2004).

3. What is the definition of Constructivism?

Constructivist beliefs have recently been applied to teaching and learning in the classroom.
Preferred definition for constructivism selected*

<table>
<thead>
<tr>
<th>Constructivism: definition</th>
<th>Preferences</th>
</tr>
</thead>
</table>
| 1. The learner actively constructs his/her knowledge using previous experiences           | Administrators: 50%  
Teachers: 26.5%  
Combined: 32% |
| 2. Existing knowledge changes only if something new is added, similar to laying bricks when constructing a wall | Administrators: 16.7%  
Teachers: 16%  
Combined: 16% |
| 3. Knowledge is constructed through a process of conceptual change                         | Administrators: 0.0%  
Teachers: 16%  
Combined: 12% |
| 4. Knowledge is constructed through experiences within a particular social setting        | Administrators: 33.3%  
Teachers: 42%  
Combined: 40% |

*Richard Cooper *Issues In Educational Research, Vol 17, 2007*

Cooper R (2007) had mentioned in his research “An investigation into constructivism within outcomes based curriculum”, that half of sampled administrators had not included constructivism into their implementation plan. The remaining 50% had introduced it to their school, but it had only been partially received by staff. The term 'constructivism' was unfamiliar to 47.5% of the teacher population. However, when presented with a selection of four definitions, 68.5% of teachers identified with one of two preferred definitions of constructivism (ie, 1 & 4 in the table above). An individualistic view of constructivism, ie, definition 1, was acknowledged by 26.5% of teachers. A social constructivism view of learning, ie, definition 4, was selected by 42% of teachers.

"Constructivism" is a philosophical viewpoint on how the mind forms and modifies its understanding of reality. It is the foundation of our outlook on pedagogy and research.”

**Definition.** Constructivism is a philosophy of learning founded on the premise that, by reflecting on our experiences, we construct our own understanding of the world we live in. Each of us generates our own "rules" and "mental models," which we use to make sense of our experiences. Learning, therefore, is simply the process of adjusting our mental models to accommodate new experiences.

Constructivism is a set of assumptions about the nature of human learning that guide constructivist learning theories and teaching methods of education.
Constructivism values developmentally appropriate teacher-supported learning that is initiated and directed by the student.

In sum, constructivist environments start with observations within a world of authentic artifacts rooted in authentic situations. Students, while accessing various materials, construct ongoing interpretations of their observations, and collaborate with their peers. Finally, students serve as coaches and teachers to each other to show their mastery of what they learned.

4. What is the origin of constructivism?

In past centuries, constructivist ideas were not widely valued due to the perception that children's play was seen as aimless and of little importance. Jean Piaget did not agree with these traditional views; however, he saw play as an important and necessary part of the student's cognitive development and provided scientific evidence for his views. Today, constructivist theories are influential throughout much of the informal learning sector. One good example of constructivist learning in an informal setting is the Investigate Centre at The Natural History Museum, London. Here researchers had explored a collection of real natural history specimens, to practice some scientific skills and make discoveries. The constructivism has The philosophy origin and The psychology origin.


5. Which are the Basic ideas of constructivist learning theory?

Learning is the process that individuals construct their cognitive structures. “Construction” is a kind of initiative, conscious, and self-organized recognition way. It is the “interaction” between the subject and the object. The learning process is the construction of knowledge. Learning is an initiative construction and the generation of meanings. This process is completed by the interaction of learners’ old and new knowledge. In other words, pure external stimulation is meaningless. Only when
learners’ code, process, and construct their unique understandings based on their previous experiences, can it be real learning.

Students enter classrooms with their rich previous experiences. They hold their opinions toward daily life and even universal issues. Even though they do not know some issues and have no experiences, they may form special explanations and assumptions based on previous experiences and cognitive abilities as some issues appear. That is not illogical guess but logical assumption based on previous experiences. Therefore, teaching should take students’ previous knowledge and experience as the growth point of new knowledge, and introduce students to generate new knowledge from the former.

As we emphasize on the students as the subjects, we should change the role of teachers, from the initiator and the indoctrinator into the helper and the driver for students constructing meanings initatively. In other words, teachers should be the designer of teaching environment, the guider for students’ learning, and the academic consultant for students. It discards the traditional teaching mode that takes teachers as the center, which merely focuses on conveying knowledge, regarding students as the object for receiving knowledge. The new teaching mode takes students as the center, under the guidance of teachers. Teachers organize and guide the whole teaching process.

**6. Why is Constructivism Important?**

Educational curricula and teaching methods are changing. One component of the current redevelopment of all subject area curricula is the change in focus of instruction from the transmission curriculum to a transactional curriculum. In a traditional curriculum, a teacher transmits information to students who passively listen and acquire facts. In a transactional curriculum, students are actively involved in their learning to reach new understandings.

Constructivist teaching fosters critical thinking and creates active and motivated learners. Zemelman, Daniels, and Hyde (1993) tell us that learning in all subject areas involves inventing and constructing new ideas. They suggest that constructivist theory be incorporated into the curriculum, and advocate that teachers create environments in which children can construct their own understandings. Twomey Fosnot (1989) recommends that a constructivist approach be used to create
learners who are autonomous, inquisitive thinkers who question, investigate, and reason. A constructivist approach frees teachers to make decisions that will enhance and enrich students' development in these areas. These are goals that are consistent with those stated by Saskatchewan Education in the 1984 government report, Directions, that launched the restructuring of Saskatchewan's curricula. This demonstrates that constructivism is evident in current educational change.

Lucks (1999) were surveyed teachers in New York, Delaware, and Maryland and asked their opinion on constructivist teaching and why? Many teachers that were surveyed said, “Constructivism is great in the special education inclusion class. It leads itself to higher order thinking and cooperative learning strategies. It enhances relevance.” “This method sways a teacher to become more organized.” “It is a great tool for teaching math productively. It is a great tool in kindergarten for developmental learning.”

7. How Constructivism Impacts Learning?

Constructivist learning has emerged as a prominent approach to teaching during this past decade. The work of Dewey, Montessori, Piaget, Bruner, and Vygotsky among others provides historical precedents for constructivist learning theory. Constructivism represents a paradigm shift from education based on behaviorism to education based on cognitive theory. Fosnot (1996) has provided a recent summary of these theories and describes constructivist teaching practice. Behaviorist epistemology focuses on intelligence, domains of objectives, levels of knowledge, and reinforcement. Constructivist epistemology assumes that learners construct their own knowledge on the basis of interaction with their environment. Constructivism impacts on curriculum, instruction and assessment.

Curriculum--Constructivism calls for the elimination of a standardized curriculum. Instead, it promotes using curricula customized to the students' prior knowledge. Also, it emphasizes hands-on problem solving.

Instruction--Under the theory of constructivism, educators focus on making connections between facts and fostering new understanding in students. Instructors tailor their teaching strategies to student responses and encourage students to analyze,
interpret, and predict information. Teachers also rely heavily on open-ended questions and promote extensive dialogue among students.

Assessment—Constructivism calls for the elimination of grades and standardized testing. Instead, assessment becomes part of the learning process so that students play a larger role in judging their own progress.

With these common assumptions, teacher planning according to the Tyler or Hunter models is no longer adequate. Research indicates that few classroom teachers plan using these models anyway (Morine-Dershimer, 1979; Zahorik, 1975) and usually because of administrative pressure if they do (McCutcheon, 1982) However, few approaches are available for working with prospective teachers or new teachers to organize for learning. Simon (1995) and Steffe & Ambrosio (1995) describe their processes of planning for constructivist learning and constructivist teaching respectively, but these methods are complex and represent the thinking of experienced teachers.

The new approach for planning using a "Constructivist Learning Design" that honor the common assumptions of constructivism. It focuses on the development of situations as a way of thinking about the constructive activities of the learner rather than the demonstrative behavior of the teacher. Most conventional teacher planning models are based on verbal explanations or visual demonstrations of a procedure or skill by the teacher which are then combined with practice of this method or skill by the student. Much of this approach seems consistent with the description of classroom activities reported in a major research study titled “A place called school” conducted by Goodlad (1984). He found that most of the time, most of the teachers talk to the kids. Students explained that physical education, fine arts, or industrial arts were their most interesting classes because they actually got to do something. They were active participants in learning rather than passive recipients of information. This is the primary message of constructivism; students who are engaged in active learning are making their own meaning and constructing their own knowledge in the process.
8. Which Constructivist Learning Design can be used for constructivist teaching?

The paper “Constructivist Learning Design” by George W. Gagnon, Jr. and Michelle Collay of represents a collaborative effort of two teacher educators to articulate a constructivist approach to "designing for learning" rather than planning for teaching. The "Constructive Learning Design" are using now has been through a variety of revisions in the past seven years and now emphasizes these six important elements: Situation, Groupings, Bridge, Questions, Exhibit, and Reflections. These elements are designed to provoke teacher planning and reflection about the process of student learning. Teachers develop the situation for students to explain, select a process for groupings of materials and students, build a bridge between what students already know and what they want them to learn, anticipate questions to ask and answer without giving away an explanation, encourage students to exhibit a record of their thinking by sharing it with others, and solicit students' reflections about their learning. We now longer refer to objectives, outcomes, or results since we expect that teachers have that determined by the district curriculum or the textbook they are using in their classroom and need to think more about accomplishing it than about writing it again. This brief overview above indicates how each of these six elements integrates and works as a whole, but all need further explanation:

1. Situation: What situation are you going to arrange for students to explain? Give this situation a title and describe a process of solving problems, answering questions, creating metaphors, making decisions, drawing conclusions, or setting goals. This situation should include what you expect the students to do and how students will make their own meaning.

2. Groupings: There are two categories of groupings: (A). How are you going to make groupings of students; as a whole class, individuals, in collaborative thinking teams of two, three, four, five, six or more, and what process will you use to group them; counting off, choosing a color or piece of fruit, or similar clothing? This depends upon the situation you design and the materials you have available to you. (B). How are you going to arrange groupings of materials that students will use to explain the situation by physical modeling, graphically representing, numerically describing, or individually writing about their collective experience. How many sets
of materials you have will often determine the numbers of student groups you will form.

3. Bridge: This is an initial activity intended to determine students' prior knowledge and to build a "bridge" between what they already know and what they might learn by explaining the situation. This might involve such things as giving them a simple problem to solve, having a whole class discussion, playing a game, or making lists. Sometimes this is best done before students are in groups and sometimes after they are grouped. You need to think about what is appropriate.

4. Questions: Questions could take place during each element of the Learning Design. What guiding questions will you use to introduce the situation, to arrange the groupings, to set up the bridge, to keep active learning going, to prompt exhibits, and to encourage reflections? You also need to anticipate questions from students and frame other questions to encourage them to explain their thinking and to support them in continuing to think for themselves.

5. Exhibit: This involves having students make an exhibit for others of whatever record they made to record their thinking as they were explaining the situation. This could include writing a description on cards and giving a verbal presentation, making a graph, chart, or other visual representation, acting out or role playing their impressions, constructing a physical representation with models, and making a video tape, photographs, or audio tape for display.

6. Reflections: These are the students' reflections of what they thought about while explaining the situation and then saw the exhibits from others. They would include what students remember from their thought process about feelings in their spirit, images in their imagination, and languages in their internal dialogue. What attitudes, skills, and concepts will students take out the door? What did students learn today that they won't forget tomorrow? What did they know before; what did they want to know; and what did they learn?

Each of these six elements of constructivist learning design has educational precedents. The following overview provides brief references to theoretical ancestors which support including these elements in organizing for learning:

1. Situations: The work of Duckworth (1987) describes situations to engage students in having their own wonderful ideas about science, Steffe and Ambrosio
(1995) use situations for students to explain in math, and Fosnot (1996) provides similar examples from writing and art.

2. **Groupings**: Schmuck and Schmuck (1988) introduced group process dynamics to classrooms, and heterogeneous groupings are common to the cooperative learning work of Johnson and Johnson (1975) or Slavin (1980a). The materials category is often included in lesson plans.

3. **Bridge**: This has some grounding in the set induction described by Gagne (1970), the anticipatory set of Madeline Hunter (1982) and the advanced organizer of Ausubel (1978).

4. **Questions**: There is precedence in Bloom's (1956) taxonomy of educational objectives in the cognitive domain which led to higher level thinking questions, Sanders' (1966) work on kinds of classroom questions, and Flanders' (1970) work describing classroom questioning strategies.

5. **Exhibit**: The work of Theodore Sizer (1992) and the coalition for essential schools include an exhibition as part of the learning process. The passages of the Jefferson County Open School in Colorado and the validations of the St. Paul Open School in Minnesota put into practice authentic assessment approaches from a variety of sources including Wiggins (1995). Documentation from Engel (1994), portfolios from Carini (1986), and alternative assessment from the North Dakota Study Group on Evaluation led by Perrone (1988) encouraged teachers to move from testing memorization of information to demonstration of student learning.

6. **Reflections**: Earlier work in Hunter's (1982) description of "transfer," the work of Schon (1987) about reflective practice of teachers, which also applies to student learning, reflection about learning through journaling as described by Cooper (1991), and Brookfield's (1986) work on critical reflection. These precedents provide a theoretical framework for a constructivist learning design.

9. **What is the difference between Traditional and Constructivist Classroom?**

The comparison of traditional and constructivist classroom is given bellow in Table 2.1.
Table 2.1
Comparison of Traditional and Constructivist Classroom

<table>
<thead>
<tr>
<th>Traditional Classrooms</th>
<th>Constructivist Classroom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curriculum is presented part to whole, with emphasis on basic skills.</td>
<td>Curriculum is presented whole to part with emphasis on big concepts.</td>
</tr>
<tr>
<td>Strict obedience to fixed curriculum is highly valued, Pursuit of student questioning is highly valued, Curricular activities rely heavily on textbooks and workbooks.</td>
<td>Curricular activities rely heavily on primary sources of data and manipulative materials.</td>
</tr>
<tr>
<td>Students are viewed as “blank slates” on to which information is stamped by the teacher.</td>
<td>Students are viewed as thinkers with emerging theories about the world.</td>
</tr>
<tr>
<td>Teachers generally behave in a didactic manner, distributing information to students.</td>
<td>Teachers generally behave in an interactive manner, umpiring the environment for students.</td>
</tr>
<tr>
<td>Teacher seeks the correct answer to validate student learning.</td>
<td>Teachers seek the student’s point of view in order to understand student’s present conceptions for use in subsequent lessons.</td>
</tr>
<tr>
<td>Assessment of student learning is viewed as separate from teaching and occurs almost entirely through testing.</td>
<td>Assessment of student learning is interwoven with teaching and occurs through teacher observations of students at work and through student exhibitions and portfolios.</td>
</tr>
<tr>
<td>Students primarily work alone.</td>
<td>Students primarily work in group.</td>
</tr>
<tr>
<td>Students study individually. The education program is processed by emphasizing induction and basic skills. Pre defined and fixed programs are main points. The program is understood as a gap to be filled by the teachers. The teachers searches for the true answers for what they teach to the students. The evaluation, is done for student learning and generally measured with tests.</td>
<td>Studies as a group. The education is given by deduction and with basic concepts. The program is directed through student questions. The weight in program activities is first hand data and used materials. The student is seen as thinker bringing contribution to the life and relevant rules. Teachers are the people in affection with the students and making environment arrangement. The teachers concerns of the students understand the basic concepts in the lesson. The evaluation is done with education and is focused on universal works The students works as union.</td>
</tr>
</tbody>
</table>

Source: Cited from Brooks and Brooks, 1993, p.17

10. Which Teaching-Learning Process can be used for Constructivism?

In constructivism, the learning is performed in the individual’s mind. The individual assimilates and actively responds to the external warnings rather than a passive receiver of the external stimulants. According to Jonassen and Jonassen (1994), the information is not transferred and stored to the individual’s brain. The constructivist asserts that all learning process is something that is related with a mental constructivism. According to this assumption, the individuals structure the elements to be learned in relation with their previous knowledge. In constructivist process, the individual does nothing but to create meanings with respect to the information and adopt such meaning with his previous knowledge. In another word,
the individual conducts the learning process by structuring the information in their minds rather than their original form in the introduction (Yaşar, 1998).

Teachers in a constructivist class (Brooks and Brooks, 1993): (1)- Accept and encourage the self-administration and entrepreneurship of students. They respect student’s opinions and they encourage students to think independently. Teachers help students for having intellectual identity. Students design the problems and the questions. At the same time, students undertake the liability of the things they learn themselves as problem solvers and analyze them. (2) - Teachers ask students open-end questions and provide the sufficient time for them to answer. (3)- Thinking at high-level is encouraged. The constructivist teachers are encouraging for students to go beyond giving simple answers founded on facts. Students are encouraged to summarize the concepts by analyzing, estimating and verifying and to establish relationships besides defending their opinions. (4)- Students are always in dialogue with their teachers and other friends. The social articles help students in changing and developing their opinions. (5)- Students should be engaged with the experiences encouraging the discussions and challenging the hypothesis. A constructivist teacher provides students with opportunities to be able test their hypothesis especially in-group discussions focused on experiences. (6)- Unprocessed data, basic resources, motivating physical and multi-interactive materials are used in lessons. (Quoted by: Aytaç, 2003). (7)- Providing laboratory activities prior to discussing the results that students seek to find, (8)- Discussing the laboratory prior to giving lesson on the subject, (9)- Establishing laboratory information desk that students can create and arrange information, (10)- Making tests requiring for students to use more concepts, (11)- Using the investigation strategy to encourage students to think and analyze, (12)- Allowing students to develop procedure in order to give answer to the laboratory question, and (13)- Locating students in the places where the groups are discussing, searching and sharing (Colburn, 2000).

The learning environment should also be designed to support and challenge the learner's thinking. While it is advocated to give the learner ownership of the problem and solution process, it is not the case that any activity or any solution is adequate. The critical goal is to support the learner in becoming an effective thinker. This can be achieved by assuming multiple roles, such as consultant and coach.
11. What is the contribution of constructivist articles in educational technology?

Kang I., et al., (2007) had studied Constructivist Research in Educational Technology: A Retrospective View and Future Prospects. The sample comprised of 385 articles which were analyzed including 100 articles from Korean journals and 285 articles from international journals. The data for the present study is mainly limited to the articles from 1990 to 2006.

Many studies on constructivism have been published almost every year, and the gradual increase of the total number of published articles in these journals directly indicates growing popularity of constructivism among researchers. To analyze which key terms or issues in the field of constructivism are studied most, the articles selected from the journals are categorized in the list of keywords for this analysis is derived from several discussions among the three authors of this paper. The result of this work among the authors is showing the list of keywords (or key concepts) on constructivism, and the numbers of individual keywords examined among the constructivist papers.

The Appendix-1 briefly summarizes how and what issues in the field of constructivism have been examined during the last decade in other countries. The recent research on IT-mediated learning matches its theoretical grounding with constructivism, or, more specifically, learning theories of scaffolding, Problem-Based Learning, Project-Based Learning, and Situated Learning.

12. Which constructivist model can work best in the science classroom?

4-E learning cycle includes four phases: (a) Exploration, (b) Explanation, (c) Expansion and (d) Evaluation. Each phase, has sound theoretical support from the cognitive development theory of Jean Piaget (quoted by Renner & Marek, 1988) and applies constructivist learning procedures. “Australian academy of science” run by Department of Education, Science and training (Australian government) also nsujest the similar model. The instructional model used in Primary Connections is based on constructivist learning theory. This theory suggests that students learn best when they are allowed to work out explanations for themselves over time through a variety of learning experiences structured by the teacher. Students use their prior knowledge to make sense of these experiences and then make connections between new information.
and their prior knowledge. To help them make the connections between what they already know and new information, teachers will organise each *Primary Connections* unit into four phases – Explore, Explain, Expand and Evaluate.

<table>
<thead>
<tr>
<th>Phase</th>
<th>Purpose</th>
<th>Role of teaching and learning activity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Explore</strong></td>
<td>Create interest and stimulate curiosity. Set learning within a meaningful context. Raise questions for inquiry. Reveal students’ ideas and beliefs, compare students’ ideas. Provide experience of the phenomenon or concept. Explore and inquire into students’ questions and test their ideas. Investigate and solve problems.</td>
<td>Activity or multi-modal text used to set context and establish topicality and relevance. Motivating/discrepant experience to create interest and raise questions. Open questions, individual student writing, drawing, acting out understandings, and discussion to reveal students’ existing ideas and beliefs so that teachers are aware of current conceptions and can plan to extend and challenge as appropriate – a form of diagnostic assessment. Open investigations to experience the phenomenon, collect evidence through observation and measurement, test ideas and try to answer questions. Investigation of text-based materials (e.g. newspaper articles, web-based articles) with consideration given to aspects of critical literacy, including making judgements about the reliability of the sources or the scientific claims made in the texts.</td>
</tr>
<tr>
<td><strong>Explain</strong></td>
<td>Introduce conceptual tools that can be used to interpret the evidence and construct explanations of the phenomenon. Construct multi-modal explanations and justify claims in terms of the evidence gathered. Compare explanations generated by different students/groups.</td>
<td>Student reading or teacher explanation to access concepts and terms that will be useful in interpreting evidence and explaining the phenomenon. Small group discussion to generate explanations, compare ideas and relate evidence to explanations. Individual writing, drawing and mapping to clarify ideas and explanations. Formative assessment to provide feedback to teacher and students about development of investigation skills and conceptual understandings. Small group writing/design to generate a communication product (e.g. poster, oral report, formal written report or PowerPoint presentation, cartoon strip, drama presentation, letter) with attention to form of argumentation, genre form/function and audience, and with integration of different modes for representing science ideas and findings.</td>
</tr>
<tr>
<td><strong>Expand</strong></td>
<td>Use and apply concepts and explanations in new contexts to test their general applicability. Reconstruct and extend explanations and understandings using and integrating different modes, such as written language, diagrammatic and graphic modes, and mathematics.</td>
<td>Further investigations, exercises, problems or design tasks to provide an opportunity to apply, clarify, extend and consolidate new conceptual understandings and skills. Further reading, individual and group writing may be used to introduce additional concepts and clarify meanings through writing. A communication product may be produced to re-represent ideas using and integrating diverse representational modes and genres consolidating and extending science understandings and literacy practices.</td>
</tr>
<tr>
<td>Evaluate</td>
<td>Provide an opportunity for students to review and reflect on their own learning and new understandings and skills. Provide evidence for changes to students’ understandings, beliefs and skills.</td>
<td>Discussion of open questions or writing and diagrammatic responses to open questions – may use same/similar questions to those used in Engage phase to generate additional evidence of the extent to which the learning outcomes have been achieved. Reflections on changes to explanations generated in Engage and Evaluation phases to help students be more metacognitively aware of their learning.</td>
</tr>
</tbody>
</table>

2.2 ANALYTICAL REVIEW OF PAST RESEARCHES

As theoretical review of the related literature provides theoretical foundations of the problem, same way the review of related researches provides practical foundations of the problem. In other words, researcher gets practical guidance about the methodological aspects of his or her study. The researcher had studied various researches done in the past, related to ‘Constructivism’ for the analytical review. The review of researches was divided in two major groups shown as under:

Analytical review for the study of the researches on constructivism was done to get the answers of the following questions.

In the selected researches for review…..

(i) What was the year of study?
(ii) What was the sample of study?
(iii) What was the school standard of the sample?
(iv) Which method was used to identify the underachievers?
(v) Which results were obtained?

To get the answers of these questions the researcher made best efforts to acquire a sample of the previous related researches from the target population of the researches. To collect the related researches, the researcher referred past and current issues of the journals like, the journal of Education and Psychology, Indian Educational Abstracts, Journal of Psychological Researches, Psycho-Lingua, Journal of Educational Research and Extension, Indian Journal of Teacher Education etc. More over that the First, Second, Third, Fourth, Fifth Survey and Sixth survey of Educational Research were referred. Many research papers were chosen and downloaded from Internet with help of ERIC, Ask, Wikipedia, Google, Mamma,
Yahoo, and Education department websites of different universities. After comprehensive efforts, related researches were collected for the review. After collection of the sample of the related researches, the abstract of each research was noted and then each abstract was reviewed on the bases of above mentioned questions.

Helland B. (2004) had studied the constructivist learning environment scorecard: a tool to characterize online learning.

The objectives of the study was to propose an analytical tool, the constructivist learning environment (CLE) scorecard, and explore its usefulness in to characterize online training.

The sample comprise of the sixteen people who signed up for the class in Midwestern University. Researcher applied it to a qualitative study of an online graduate sociology course. The participants involved in study were between the ages of 25 – 47 living in geographically dispersed regions in the U.S. None of the respondents were fulltime students and they represented a variety of professions. Based on a review of the time periods when items were posted to the threaded discussion groups, the majority of students in the study logged onto the system during non-working hours.

The findings of the study were: The study was primarily undertaken to test the design and development of the CLE scorecard. The advantage of using an identifier rather than a score is that the identifier maintains the information from each individual component in the scorecard. Thus, this instrument could also be used to compare elements in many courses or to establish a baseline if the goal is to modify an existing course. In the study researcher examined the course syllabus and instructions as well as the transcripts from chat sessions and threaded discussion groups to establish the final, mixed rating for each component in the scorecard. In order to identify what course elements were successful, prior to the start of the course, researcher should have generated an identifier based on the evidence found the class syllabus and course instructions. Once the course was over, researcher should have generated a second identifier based on the evidence gathered from the transcripts of the chat sessions and threaded discussion and the student questionnaires. The comparison of the two characterizations would more accurately identify the learning areas that needed refinement or more study. Even though researcher didn’t generate a
pre- and post-identifier for the class in his study, researcher felt that the CLE scorecard was useful in that it identified possible connections between the categories. For instance, the lack of course elements that encouraged the students to work collaboratively may have contributed to learners relying on the instructor to guide their learning.


The objectives of the study were: The purpose of this study was to determine how students would perceive constructivist approaches in the classroom and their own learning. The researcher was particularly interested in (a) how easily students would adapt to the approaches, (b) approaches perceived as useful by students, and (c) approaches that were not effective.

The sample comprised of nine students. The students were enrolled in the instructional media production course. Some of the students attended the university on a full-time basis; others were part-time students. Fifty percent of students were employed full-time in the education or training industry, others were employed on a part-time basis. Students in this group varied greatly on distribution of age, progress made in their program and, subsequently, varied greatly on existing computer and authoring skills. However, all students in the course had successfully completed an instructional design course, a prerequisite for the course. The instructor and graduate assistant observed students during the class sessions. The instructor initiated discussions regarding the assignments and tools used. The students were asked to complete a 3-minute evaluation form after each class session to provide feedback to the instructor. The instructor encouraged students to contact her with any questions relating to the course and provided professional and personal contact information on the syllabus. In addition, students had the opportunity to contact a graduate assistant who was available during class and by appointment. The graduate assistant kept the instructor abreast of students who sought his assistance. In addition, students were asked to provide feedback about the course during a short interview session. Participants were informed that the short session was not a course or instructor evaluation and that the purpose of the interview was not to gather positive feedback. Rather, the interviewer was interested in ascertaining strategies and activities that helped the student learn. The question was: What activities have helped you learn the
materials in this course? After students responded to this question, they were asked to complete a questionnaire with a listing of specific course elements and strategies. Individuals indicated which elements were or were not helpful and identified the five most helpful activities.

The main findings of the study were: Activities considered helpful. All participants indicated the following course activities had been helpful in their learning: (a) in-class discussions in small groups and as a whole, (b) showing and viewing completed assignments, (c) completing a research paper draft, (d) designing a personal Web page, and (e) working on all parts of the client project (proposal, outline, flowchart, storyboards, and the product itself), (f) providing and receiving feedback during a formative evaluation, and (g) presenting the final group project to the class. One activity not considered helpful by the majority of the students (more than 50%) was reading assigned chapters in the Dreamweaver textbook. A large percentage of students (44.4%) did not consider the threaded discussions helpful, and 33.3% did not consider the image manipulation project with Fireworks, the final examination, and “our” course attitude as valuable in their learning process.

Fardanesh H., (2006) had studied A Classification of Constructivist Instructional Design Models based on Learning and Teaching Approaches.

The objective of the study was to Classify the Constructivist Instructional Design Models based on Learning and Teaching Approaches.

The sample comprised of 10 models from the population of 25 constructivist instructional design models that were identified as a result of conducting a comprehensive search in resources and data bases. The sample selection method used is Reputational-Case selection (LeCompte, et.al., 1993; 76-77), in which reputational constructivist models are selected based on questioning from several experts in the field of instructional design; and as a result the following ten models were selected: 1. Participatory Design 2. Anchored Cognitive 3. Cognitive Apprenticeship 4. Generative Learning 5. Computer Supported Intentional Learning Environments (CSILE) 6. Discovery Learning 7. Interpretation Construction (ICON) Design 8. Mind Tools 9. Problem-Based Learning (PBL) 10. Project Method. In a conceptual-analytical study using a deductive classificatory content analysis method ten constructivist instructional design models were selected, and learning/teaching approaches within each model were appraised. Using the original writings of the
originators of each design model, the learning and teaching approaches employed or permitted to be used in each model (1) individual; (2) group; and (3) dual-purpose approaches. A six-category classification of constructive instructional design models was achieved. Findings show that none of the models has both dual-purpose teaching/learning approaches, and in teaching and learning approaches, most of the models fall in the "individual" category, and only few models fall in the "group" category with regard to teaching and learning approaches.

The findings of the study showed that there are very few design models with sociocultural approach, compared to models with social approach (the group column under learning approach compared to individual column). Considering the design and development requirements of the models with socio-cultural approach, they are more difficult than the other models. The social learning approach models with eight models in the column of individual learning approach are the most popular design models. This point shows that the socio-cultural approach has not penetrated the literature of the instructional design at an optimal level. The dual-purpose column under teaching approach represents the models with high degree of applicability in all kinds of instructional situations. The models under group teaching approach seem to be suitable for all kinds of topics and subject matters. Finally, the models under individual teaching approach are most suitable for instructions with individual learning goals. The models with dual-purpose learning approach might lead to deep learning objectives, especially the objectives related to social issues.


The objectives of the study was to study the effects of a constructivist approach on academic achievement, self-concept and learning strategies, and student preference.

The sample comprised of 76 six grade students. The students were divided into two groups. The experimental group was taught using the constructivist approach while the control group was taught using the traditional approach. A total of 40 hours over nine weeks was used to implement the experiment. The instruments used were as follows; mathematics tests administered by the teacher, self-concept inventory, learning strategies inventory, and a classroom environment survey. The results are 1) constructivist teaching is more effective than traditional teaching in terms of academic
achievement; 2) constructivist teaching is not effective in relation to self-concept and learning strategy, but had some effect upon motivation, anxiety towards learning and self-monitoring; 3) a constructivist environment was preferred to a traditional classroom. **Methods** 76 elementary six graders were divided into two groups: the experimental group, 38(male 21, female 17), and the control group, 38(male 22, female 16). The learning task was mathematics of sixth grade level (counting, areas of circle and fans, area and volumes of trunks, ratio graphics and proportions) for sixth graders. The treatment period was 40 hours over 9 weeks. The constructivist teaching approach based on Yager(1991) undertook the following steps: 1) inviting ideas; 2) exploring; 3) proposing; 4) explanation and solution; 5) taking action. Traditional teaching approach undertook the following steps: 1) introduction; 2) development; 3) review. The instruments to validate the effectiveness were: a) academic achievement test made by classroom teacher; b) self-concept inventory which includes 15 items of general self-concept, 20 items of academic self-concept, and 20 items of non-academic self-concept. Cronbach alpha for the scales range from .74 to 81 and test-retest correlation coefficient for the scales range from .85 to .93 learning strategies inventory made by Claire et al includes 77 items 8 items of learning attitude and interest, 8 items of motivation, diligence, self-discipline, willingness to work hard, 8 items of use of time management principles for academic tasks, 8 items of anxiety and worry about school performance, 8 items of concentration and attention to academic tasks, 8 items of information processing, acquiring knowledge, and reasoning, 5 items of selecting main ideas and recognizing important information, 8 items of use of support techniques and materials, 8 items of self-testing, reviewing and preparing for the classes, 8 items of test strategies and preparing for tests), with each item being scaled by 5 on the Likert scale. Coefficient Alphas for the scales range from a low of .68 to a high of .86 and test-retest correlation coefficients for the scales range from a low of .72 to a high of .85, demonstrating a high degree of stability for the scale score; d) the classroom environment survey on constructivist teaching made by Kim(1997), 41 items which includes 7 items of relevance of the learning tasks, 4 items of big concepts presented by the teacher, 11 items of seek and value learner's view by the teacher, 11 items of learner supposition, 8 items of assessment in the context of teaching. Coefficient Alphas for the scales range from .74 to .82 and test-retest correlation coefficients for the scales range from .72 to .83. The research design was a nonequivalent control group of pretest/post-test design as follows:
<table>
<thead>
<tr>
<th>Pretest</th>
<th>Treatment</th>
<th>Posttest</th>
</tr>
</thead>
<tbody>
<tr>
<td>O1</td>
<td>X1</td>
<td>O2</td>
</tr>
<tr>
<td>O3</td>
<td>X2</td>
<td>O4</td>
</tr>
</tbody>
</table>

O1 O3: Pretest of Academic Achievement, Self-concept, Learning Strategies  
O2 O4: Post-test of Academic Achievement, Self-concept, Learning Strategies  
X1: Constructivist Teaching  
X2: Traditional Teaching

The findings of the study were as follows: The academic achievements of the experimental group compared with those of the control. The experimental group scored an average 64.60 at pretest and 75.65 at post-test for a 11.05 gain while the control group scored an average 69.73 at pretest and 64.65 at post-test for a 5.08 decline. In order to determine the effectiveness of constructivist teaching on academic achievement, pretest and post-test scores were statistically analyzed by teaching methods as the independent variable, academic achievement of the students as dependent variable. Covariance analyses were performed and the results are shown. there is a significant difference found between the constructivist teaching group and the traditional teaching group at p<.001 with F=89.11 in academic achievement. Therefore, the constructivist teaching group outperformed the traditional teaching group in academic achievement.

Karaduman H. and Gultekin M., (2007) had studied the effect of constructivist learning principles based Learning materials to students’ attitudes, success and Retention in social studies.

The objectives of the study were: (1) to figure out the effectiveness of teaching materials, which were based on the principles of constructivist learning, with regard to the learners’ attitudes toward the social science courses, learner achievement and retention levels of the learners. Concerning the above objective, following research questions are posed; 1. Is there any significant difference between the learner attitudes of the learners in the experimental group, which used teaching materials that designed regarding the principles of constructivist learning, and control group, which used traditional teaching materials in their social science courses? 2. Is there any significant difference between the academic achievements of the learners in the experimental group, which used teaching materials that designed regarding the principles of Constructivist learning, and control group, which used traditional
teaching materials in their social science courses? 3. Is there any significant difference between the retention levels of the learners in the experimental group, which used teaching materials that designed regarding the principles of constructivist learning, and control group, which used traditional teaching materials in their social science courses? 4. What are the viewpoints of the learners in the experimental group on the utilization of the teaching materials that designed with regard to the constructivist learning principles?

The sample comprise of 72 5th grade students in Şehit Ali Gaffar Okkan Elementary School in Eskişehir. The data was collected in fall term of 2004-2005 academic year. Participants were divided into two groups: the control group (5-B) and the experimental group (5-C). The definition of the groups as experimental and control was based on evenhanded principles and they were labeled through drawing of lots. There are 36 students in each of the groups. If a participant does not have any partner with similar demographic information s/he is eliminated and dropped from the groups. Accordingly, 20 students out of 36 in each group were selected as pairs, and on account of the equalization process total 40 students from the participants of the study. The present study is designed as a control-grouped (Karasar 1998) experimental research model with pre-test and post-test in order to examine the role of teaching materials, which were based on the principles of constructivist learning, on the learners’ attitudes toward courses, learner achievement and their retention levels. Two groups were objectively identified as experimental and control groups, and the learners in both groups were examined through pre and post tests. Additionally, a questionnaire, which inquires the perspectives of the learners on the use of teaching materials that are based on constructivist learning principles, is used in order figure out the learner preferences.

The findings of the study were: The results obtained through this study show that teaching material prepared according to constructivist learning principles increase the academic success and retention levels of students in Social Studies courses. Also students have found the material prepared according to constructivist learning principles appropriate to constructivist learning principles. In light of the results and findings of the study the following suggestions are brought forth:

(1) The teaching material prepared for this research in accordance to constructionist theory can be used by teachers in Social Studies courses and taken as example. (2) Teachers can be provided with occupational training on preparing material in
accordance to constructionist theory. (3) Other Social Studies units can be prepared as activity booklets according to constructionist learning principles.

Mccray K.,(2007) had studied Constructivist Approach: Improving Social Studies Skills Academic Achievement.

The objectives of this qualitative study was examine the relationship to constructivism as it relates to improving social studies skills and to determine whether constructivism is the best approach to take in improving social studies skills.

The sample comprised of 25 teachers located in the urban and suburban area of Southeastern, Michigan. The phenomenon that the researchers had studied was the degree of similarity between the theories-in-action of several social studies teachers at urban and suburban area school, and its effect of any variation on constructivism. This report describes a program designed to enhance social studies skills and knowledge. The target areas for enhancement are geography, economics, history, and core democratic values. The need for strengthening these skills was documented by literature, and surveys. An analysis of probable cause for lack of social studies skills revealed that Constructivist technique may improve students’ academic performance and achievement. Social and Cognitive Constructivist learning methods were the main focus of the interventions chosen to help students to achieve higher academic achievement Post-intervention data upheld the premise to what extent that these strategies would serve to raise the students skills and understandings in the area of social studies and community. A qualitative research and action research design had used in a survey sampling 25 teachers between the ages of 25 and 50 years old throughout the Southeast Michigan, including urban and suburban schools. **Variables**

The independent variable had constructivist approach and the amount of teacher and student collaboration in utilizing the constructivist approach in the classroom. The two dependent variables had the students’ knowledge of social studies. The second dependent variable is an improvement in social studies skills. The data collection and analysis will focus on the curriculum and the constructivism teaching method each teacher uses to teach social studies. **Method of Data Collection**

The data had generated using a survey questionnaire on a five point Likert scale, which will use a scale of (1) strongly agree, (2) agree, (3), undecided (4) disagree and (5) strongly disagree. Numerical values had assigned to each category. A teacher’s survey sheet had distributed only to teachers who participate in the research. Each participant had
assigned a number. Each of the questionnaires had numbered and each teacher had required using the same form. All instruments had maintained for confidentiality of participants. Last, using the survey designed for the study will test face validity.

**Data Analysis Procedures** The researcher had used reflective analysis to analyze the data. The researchers will assess the degree of agreement between the theories in action, and the potential impact of any observed disagreements on students learning. Once the data has been generate, the researcher had assembled the data using an interpretational analysis and design a chart using Excel with tally marks to indicate the responses. The researcher had shown the actual data for each social studies class on each variable. Product-moment correlation coefficient had calculated to determine the degree of relationship between the independent and dependent variables Based on the review of literature, the researcher had investigated whether constructivism improves test scores and overall academic achievement. Also, the literature review of several researchers who have studied the relationship and provided evidence that Constructivism Approach to learning has proven to be most effective when improving social studies skills. In addition, the researchers have provided useful information, strategies and techniques that had enhance overall higher academic achievement for students. The teacher also had fun implementing recommended strategies that will enhance their academic performance in their social studies class. Furthermore, this proposed research would provide teachers with constructive ideas could be utilized to enhance their overall comprehension and academic performance in social studies.

The findings of the study were: Twenty social studies teachers in school districts throughout Southeastern Michigan answered twenty-five statements on a survey. All the data collected indicates that most of the teachers agree with the findings of the literature review, which implements that various use of constructivism had improved social studies skills. The teachers also agreed that their students learn best when they can relate to the subject manner. Majority of the teachers agree that they currently use some form of constructivist in their classroom. When asked the teachers that the teacher’s role is to facilitate students learning by challenging a student’s reality through active experiences and the creation of new ideas they all agreed (100%). Based on the results of this survey and the review of the literature regarding constructivism and to what extent had it improve social studies skills, activating prior knowledge can improve overall academic achievement in social studies skills. The literature review of several researchers including the researcher that
was performed in this research have studied the relationship and provided evidence that Constructivist Approach to learning has proven to be most effective when improving social studies skills. Furthermore, this proposed research also provided teachers with constructive ideas can be utilize to enhance their students overall comprehension and academic performance in social studies.


The objectives of the study was to present issues and trends related to constructivism in educational technology manifested over the last decade and to identify and plot trends for the next decade.

The sample comprised of 385 articles which were analyzed including 100 articles from Korean journals and 285 articles from international journals. Along with a socially urgent impetus for revolutionary reform of an educational environment appropriate to the 21st century society, constructivism is highlighted in various fields related to education as an alternative educational ideology and approach. Despite its radical shift from traditional learning environments, and the diverse interpretation and understanding among scholars on the nature of constructivism, constructivism surely has brought out meaningful changes and developments in understanding how people learn. In light of this context, the present study aims to retrospectively review the last decade of constructivism, which had followed by a brief prospective on its future in the next decade, simultaneously taking into account expectations as to how constructivism can stand firm as a theoretical basis for the digital age. Research Method The purpose of the study is to present issues and trends related to constructivism in educational technology manifested over the last decade and to identify and plot trends for the next decade. For the purposes of this study, a literature review on constructivist research is employed as the research method, while the process consists of the following four stages: 1) Problem formulation, 2) Literature search, 3) Data evaluation, and 4) Analysis and interpretation (Cooper, 1998). Problem formulation. The research problems of this study are formed as follows: 1) to examine the characteristics of the constructivist approach in the Korean educational technology field over the last decade, which is then compared with those in other countries; 2) to investigate the future of constructivist approaches over the next decade. Literature search. The literature review on constructivism over the last decade was based upon a few representative journals of the educational technology
field which includes two Korean journals (Korean Journal of Educational Technology, Korean Journal of Educational Research) and three international journals (Educational Technology, Educational Technology Research & Development, British Journal of Educational Technology). Since the debate on constructivism in the educational technology field, in fact, only became truly active in 1991 when Educational Technology (hereafter, ET) published a special issue on constructivism, the data for the present study is mainly limited to the articles from 1990 to 2006. In total, 385 articles were analyzed including 100 articles from Korean journals and 285 articles from international journals Data evaluation. In order to enhance the validity of data analysis and classification, the authors of this study follow the steps of (1) categorizing keywords or key concepts of constructivism from the journals mentioned above, (2) calculating and comparing the coefficient factor among the authors, which is .93, (3) negotiating their individual views on the classification, (4) modifying and developing the criterion on classification, and finally, categorizing the literature according to the criterion on classification. Analysis and interpretation. Data analysis in this study was mainly content analysis based upon the criterion of classification. Content analysis, according to Stemler (2001), is a powerful data reduction technique. Its major benefit comes from the fact that it is a systemic, replicable technique for compressing many words of text into fewer content categories based on explicit rules of coding (Stemler, 2001). Excel 10.0 is employed as the data analysis tool.

The findings of the study were learning sciences are basically rooted in the traditions, beliefs, philosophy, epistemology, and strategies of ‘social constructivism’ (Kolodner, 2004; Smith, 2004). In conclusion, constructivism, encompassing many specialized fields relevant to the topic of learning, has and is currently undergoing a wide and active evolution, and hence comes to terms with the ‘learning sciences’. In this context, the future of constructivism had as active and pervasive as the past and present. As the learners are ‘actively complex, socially-embedded, and developmentally dynamic self-organizing systems’ (Mahoney, 2004), constructivism also had gone through ‘on-going, self-referent or recursive’ development or growth in ‘living webs of relationships’ in which a dynamic dialectical tensions are essential to attain ‘ordering process’ (Mahoney, 2004). The future state of constructivism, then, will flourish in the form of the ‘learning sciences’ where technology is a very important tool to promote learning in powerful ways (Smith, 2004). The final term to describe the future of constructivism is, not ‘beyond constructivism’ (Winn, 2003).
which emphasizes the weaknesses or limitations of constructivism, but rather ‘post-constructivism’ which promotes the expansion of constructivism in the form of the ‘learning sciences’.

Doğru M. and Kalender S., (2007) had studied Applying the Subject “Cell” through Constructivist Approach during Science Lessons and the Teacher’s View

The objectives of the study was to applying the subject of Cell in the Primary School Science lessons according to the constructivist approach and obtaining teachers’ point of views. Two questions were considered 1. Is there any difference in the Primary School Science lesson teachers’ being able to apply the constructivist approach in their classes according to their years in duty? And 2. Is there any difference between the success levels and knowledge permanence of the control group using traditional method and the test group using constructivist approach, in which the subject of Cell is taught?

The sample comprised of 52 students. The study, has been carried in 23 schools in Mersin City Center with 53 Science Teacher and two branches of Davultepe Atatürk Primary School where is Mersin City Davultepe district, where 52 students are used as 24 of them in control group and 28 of them in experimental group. determine how the teachers are applying the structuralist approach in their classes by classifying the teachers according to graduated faculty, department and their years in the duty. Besides understanding the difference of the effects of structuralist approach and traditional education method on student success and knowledge sustainability For the study the teachers are given likert type surveys and primary school 6th class students are used as final test and the repeat of the last test as data collecting tools The poll has been applied to teachers and the final test and same test after 15 days has been applied to the test students. While analyzing the final test data to measure the success and sustainability of the students t test is used. The Methods Used in the Study The poll and application method is used in this study. The poll is an observation by preparing a question list which the information obtained people will directly read and answer (Seyidoğlu,2000). The application method, as it can be understood from the name, is the studies of trying and controlling of two or more parameters. (Cebeci, 1997). The poll has been applied in 23 primary school for 53 teachers for 1 months of period. The application is in Davultepe Primary school
students in Mersin City Davultepe District. The experiment group of 28 children is 6/A and 24 children is from 6/B class **Data Collecting and Tools** The poll is prepared by researcher as a data collecting tool. After the poll is applied and collected, SPSS program is used for data analyze and the analyze of each material has been evaluated when they are active during the application. These evaluations are portfolio evaluations, mid term, and the evaluation of the end of lesson. The application ends the test as data collecting tool and has been prepared by the researchers and approved by the specialists. With the exam for end of application, the success rates are measured and with the test being applied 15 days later, the sustainability of the knowledge is measured. T test is used as the data collection tool for the analysis of the test.

The findings of the study were: The findings regarding the t test results analyze of the constructivist approach in the experiment and control group students and Traditional Instruction methods' success in telling the Cell subject group is X= 33,4643 and control group is X= 28,1250. ( t = 1,120 ; p> 0,05 ) therefore there is no meaningful difference for the groups The Findings regarding the t -test result of the final test points to measure the sustainability of the success obtained by telling in the Constructivist Approach and Traditional Instruction Methods. Experiment group X= 34,7857 and the control group is X= 26,750. ( t = 1,178 ; p< 0,05 ). Therefore, there is a meaningful difference between the groups.

**Chindgren T (2008)** had studied Knowledge sharing at NASA: extending social constructivism to space exploration.

The objectives of the study were: (1) To provide a brief overview of traditional learning and development efforts and the current knowledge sharing initiative. (2) To introduce the approach for incorporating information and communication technologies (ICT) to foster storytelling and sustain communities.

The methods used to respond to this question were a literature review, author observations and content analysis. The literature on social constructivism was largely drawn from the adult learning/human resource development research because of the learning thrust of the APPEL Knowledge Sharing activities. A literature search was also conducted within the knowledge management scholarly and practitioner literature on storytelling, because the philosophy that undergirds the Knowledge Sharing effort is highly influenced by knowledge management. The author then observed the use of
storytelling at NASA forums, as well as reviewed publications containing stories provided by seasoned NASA program/project managers and engineers. This applied theory paper is intended to inform human resource development researchers and practitioners about a current organizational initiative.

The findings of the study were: Social constructivism theory had implications for human resource development at NASA. Today at NASA, the community of practice model of knowledge sharing refers to any joint enterprise that brings individuals with shared interests together; communities of practice are relationships of mutual engagement that bind members together into a social entity of communal resources (Brown & Duguid, 1991; Chindgren & Wiswell, 2006; Lave & Wenger, 1991). Membership is based on voluntary participation of individuals who share values and work to resolve problems together. Members value all kinds of knowledge (including, for instance, hunches as well as demonstrable scientific knowledge) that transpires within a community. NASA is increasingly promoting learning based on collective performance and encouraging relationships within and across communities. Storytelling facilitates this vision. The Viking mission experience, the iRobot lesson learned, and the HyTEX project cancellation are interesting ways to present information. Practitioners resonate with the situation, empathize with the project team members and frequently personalize the information to themselves or people they know. As practitioners collectively listen to the stories at the Masters Forum, and read and reflect upon the articles in ASK Magazine, core values and beliefs are reinforced within the program management and systems engineering communities. Knowledge sharing conferences, publications, and multimedia provide NASA managers, scientists, and engineers with examples and lessons learned from overcoming project challenges. The conferences include the semi-annual Masters Forum and the annual program management conference, PM Challenge Conference. Publications include the award-winning ASK Magazine, a recently launched biweekly electronic newsletter, and a library of robust case studies used throughout NASA to facilitate discussion and learning. In addition, Knowledge Sharing broadcasts video clips through the APPEL website featuring leading thinkers and practitioners in the fields of knowledge management, program leadership, and systems engineering. This applied theory paper used social constructivism as a framework for exploring communities of practice and storytelling at NASA. Social constructivism explains the process of practitioners learning from others through stories and “hands-on” activities. Although social
constructivism theory describes learning, elements such as active inquiry, relationships, and environment are shared with our understanding of communities of practice and storytelling within organizations. Also included in this paper was a brief overview of traditional learning and development efforts at NASA which illustrate the evolution of the current knowledge sharing initiative. With an understanding that learning is social and comes largely from the shared experience of participating in activities with fellow practitioners, APPEL has been able to encourage knowledge sharing and facilitate learning throughout NASA and with its industry and university partners. Storytelling has been a powerful tool to showcase problems and challenges and present detailed first-hand accounts of how they were confronted and, in many circumstances, how certain challenges were overcome successfully. Finally, the conceptual plan for incorporating ICT to sustain communities and foster storytelling was introduced.


The objectives of the study were to investigate the effect of the use of an alternative science text created through the integration of some methods based on a constructivist view of learning in a quasi-experimental setting and to get some feedback from chemistry teacher candidates about the use of this text as a textbook in class. Accordingly the research questions were: (1) Is there a difference between the alternative text and the traditional text in terms of preservice teachers’ understanding of acids and basis? (2) What are the preferences (whether the alternative text or the traditional text) of the pre-service teachers regarding the text and their reasons for that preference?

The sample comprised of 80 chemistry teacher candidates at Gazi University in Ankara. Researcher selected teacher candidates because they were both students and teachers. There were two groups of chemistry teacher candidates in the university. The first group consisted of 40 students enrolled in the Secondary Science and Mathematics Education Department and the other group consisted of 40 students enrolled in a non-thesis master degree in chemistry education. Students’ understanding was measured with the Acids-Bases Achievement Test. This test was developed by the researchers. It had a total of 9 items; 5 essays and 4 short answer items. There were 5 items measuring knowledge and retention and 4 items measuring
comprehension and inference. Each item was scored out of ten points. A scoring rubric was designed and two independent raters scored the test. Interrater reliability was calculated for retention and inference items separately. Interrater reliabilities were found; for pretest \( r_{xy} = .94 \) and \( r_{xy} = .98 \) for retention and inference items, respectively, and for posttest \( r_{xy} = .87 \) and \( r_{xy} = .98 \) for retention and inference items, respectively. In this study, the use of inquiry methods, learning cycles, a conceptual change model and analogy in creating Alternative science texts was discussed. An alternative text on the topic of acids and bases was created by Integrating the methods and models discussed in this paper. The alternative text and a sample of a traditional Text taken from a textbook, which is still used in turkish high schools, were given to two groups, totaling Pre-service teachers—the alternative text was given to an experimental group and the traditional text to a Control group—in an experimental setting and their understandings of acids and bases were compared. In Addition, in the second step of the study, the pre-service teachers read both texts and indicated their preferences In terms of interest, understandability and helpfulness. The experimental group consisted of 20 students (9 Chemistry Teaching major students and 11 non-thesis master degree students) and the control group consisted of 22 students (12 Chemistry Teaching major students and 10 non-thesis master degree students). All of the students were taking the course of “Analysis of Science and Chemistry Textbooks” and the text activity of the study was applied as a part of the course. This text format is a challenge to traditional formats and may not be the perfect one but with its narrative feature and different structure, it contains promise in being able to replace traditional textbook formats. For further improvement in creating better texts, these suggestions are worth considering: 1. The number of studies into alternative text formats is already very limited. More studies are needed. The feedback obtained from teachers in this study is encouraging for the conducting of further studies. 2. This study is limited to a certain number of preservice teachers. More teacher opinions could give more valuable feedback. 3. The format of the text can be improved. For example, more interesting stories can be created or better analogies can be found. Moreover, other strategies such as concept maps, POE (predict-observe-explain) and 5E can be integrated into the text body to obtain better texts. 4. The effects of the text as supporting material in constructivist classes need to be investigated. This text could be good material for the teachers who oppose the use of traditional texts in their classes. 5. The most important barrier that alternative texts
encounter can be students’ habits of learning; they are used to direct reception of knowledge from textbooks. It may take time for students to benefit more fully from alternative texts. 6. The effect of the text should be investigated at the primary school level (with primary school students) and compared with the results here. Guzzetti, Williams, Skeels, and Wu (1997) state that the inclusion of narrative structures is unnecessary at the secondary level and accordingly, as our text format has narrative features, there is a possibility that the higher the students’ level, the weaker the effect of the text. 7. This alternative text was a model text for the recent primary education curriculum reform in Turkey. Many countries had similar curricular reforms and will need alternative materials. This text format or an improved one could be a good alternative.

The findings of the study were: The literature cited in this paper indicated that Alternative texts did have some effect on students’ Understanding. However, the text we have created did not Show any remarkable effect on students. The mean of the Control group’s knowledge scores was improved (the Difference between pretest and posttest scores) more than those of the experimental group’s knowledge scores but ANCOVA results showed that this was not statistically Significant. The means of both groups’ comprehension Scores were almost equally improved; no statistical Significance was observed as a result. While selecting the Sample, we assumed that pre-service teachers could be Considered as students because of their limited conceptual understandings of scientific concepts but this assumption could have failed and maybe, Therefore, no difference was observed. Another possibility is that the testing threat could have affected the results since The period between pretest and posttest was relatively short (two hours). Findings suggest that the concepts of acids and bases can readily be taught by teachers using this alternative text in the classroom or laboratory. This text was not intended, however, to be primary source of learning; it cannot replace hands-on activities, inquiry activities and the teacher’s role in the classroom or laboratory. As Musheno and Lawson (1999) stated “the textbook readings of concepts still must be used only after the concepts were already experienced.”
Yorek Nurettin al., (2008) had studied an investigation on students’ perceptions of biodiversity.

The objectives of the study was to investigate pupils’ constructions of some concepts related to biodiversity like classifying living things, variation in living things and ecosystem elements, and the concept of life in the light of constructivist theory of learning.

The sample comprised of ninth–grade students (n= 191) selected via cluster sampling method from the population and seven biology teachers teaching in these students’ schools. The population of the study was consisted of all the ninth–grade students attending secondary schools in a large province in city of Izmir–western Turkey and biology teachers working in the same province. Based on the constructivist approach, the study employed qualitative research Methods (Yıldırım & Simsek, 1999; Shepardson, 2005; Bogdan & Biklen, 2007). The National Curriculum in Turkey was analyzed to determine students’ conceptual understanding level. According to this analysis, ‘Conceptual Understanding of The Living Things and Classification’ (CULC) test was developed. In addition, semi–structured interviews were carried out with seven teachers and 14 students to gather information about course structure and students’ conceptual understanding. The CULC test is shown below. Questions asked in Conceptual Understanding (CULC) test 1. Write down the names of ten living things that come to your mind first. 2. It is estimated that there are millions of species living on Earth. If you were asked to classify all the living things (species) into main groups, without leaving anyone, at least how many groups could you from? 3. When all the living things were considered, what do you think is the place (position) of human beings? 4. What kind of feeding relationship can be seen among the following living things which live in a certain area? Grasshopper, weed, hawk, mice. 5. What do you think could be the feeding relationship among these living things if hawk would be removed from the area? 6. In your opinion what are the elements of a forest ecosystem? 7. When an apple fallen from an apple tree to the soil is not taken out, you will see that in a certain period of time it had rotten and disappear. How do you explain this? Interviews with students By students’ willingness to participate taking into account, with the help of teachers, 14 students, two (one girl, one boy) from each class, were selected for the interview. Some information, which could not be obtained via conceptual understanding test or by
written tests, some points which need to clarify was obtained through interviews. Interviews, lasted about 30–40 minutes, were recorded using a digital voice recorder and then transcribed. The consent of all the students was obtained for the use of a voice recorder during interviews. **Interviews with teachers**

Teachers were interviewed to learn more about their ideas about the curriculum and number of hours per week, biodiversity, their method of instruction, and the use of resources, and this provided additional data for the study. Interviews were recorded using a digital voice recorder and transcribed for the later analyses.

The findings of the study were: the results of the CULC test administered to 191 students in seven schools were evaluated and interpreted in the context of research questions and under the following sections. 1. Relational construction of the concept of life and the living things 2. Student classification of the living things 3. Position of human among the living things 4. The significance level of the living things. Excerpts from the interviews of 14 students and seven teachers are used to explain the data obtained from written conceptual understanding test or to clarify ambiguous points in the written data. In addition, excerpts can be used for clarifying or supporting students’ ideas revealed in the conceptual understanding test. In summary, we may suggest that cognitive construction of the life concept occurs mostly by associating it with animals. In addition, according to our results, the first living thing with which the concept of life was associated was human. In this construction, plants came after animals and humans in terms of the concept life. In the light of the results obtained and discussed with the related literature in this Study, the following recommendations for a better environmental education and for making The next generations to understand the importance of biodiversity for a better future can be Listed: the concept of biodiversity should be placed comprehensively in biology and Environmental education programs in order students to develop the environmental protection Consciousness. the anthropocentric understanding of nature observed in students should be taken Into account and in educational programs dissuasive activities for students to change their Minds should be organized. The value of living things in the nature should be handled in the light of the harmony among all living things, not because of their harm or benefit to human beings. in educational programs, while explaining the group of living things, instead of giving Examples like the relationship between the living things and their effects to human health, Some other examples like the humans’ congruence with the nature should be
used. Based on the holistic understanding of nature observed in students, a new Environmental education program, in which holistic and eco-centric consciousness is developed, should be developed. Environmental education courses in educational faculties should be reviewed According to the new understanding. In-service biology and science teachers who are generally responsible for the environmental education, should be informed about the new understanding by means of in-service educational courses.

Olgun O. and Adali B., (2008) had studied Teaching Grade 5 Life Science with a Case Study Approach.

The objective of the study was to investigate the effects of a case study approach on students’ achievement and attitudes towards viruses, bacteria, fungi, and protista.

The sample comprised of 88 Fifth-grade students from two different classes. The comparison group students received their instruction by traditional teaching, whereas the experimental group students were instructed with a case study approach. Achievement and attitudes were measured before and after instruction. Out of two intact science classes, one class was randomly assigned as the experimental group and experienced the case study approach, whereas the other class was assigned as the comparison group and experienced traditional instruction. Participants of the study belonged to middle-class families. The school where the study was conducted was a public school. Students began to study science in 4th grade with one life science unit and one earth science unit. Before 4th grade, the students took a course where science and social science topics were taught together. The students’ home language and the language of instruction was Turkish. There were 43 students (18 male, 25 female) in the experimental group and 45 students (21 male, 24 female) in the comparison group. In this study, a two-group, pretest/posttest design was utilized in order to determine the effectiveness of the two different instructional methods: (1) case study and (2) conventional large group. The students’ reflections about the instruction written in their journals at the end of the treatment served as qualitative data. Quantitative data was collected using two instruments administered as pretests and posttests: (1) Science Achievement Test (SAT) and (2) Attitude Scale Towards Science (ASTS). The students’ science achievement on the Viruses, Bacteria, Fungi, and Protista unit was measured with a 25-item, multiple-choice test (SAT) developed by the
The developmental stage of the SAT was guided by the instructional objectives stated for the *Viruses, Bacteria, Fungi, and Protista* unit. Careful consideration of the learning outcomes defined the content of the test. Bloom and Krathwohl’s (1956) taxonomy of cognitive levels was considered during the preparation of the test items related to the learning outcomes. Each test item included one correct answer and three distractors. A group of experts in measurement and evaluation, science, and science education examined the test for the appropriateness of the items in terms of the extent to which the test measures a representative sample of the domain of tasks (validity) with respect to the *Viruses, Bacteria, Fungi, and Protista* unit of the elementary school science course. The internal consistency and reliability of the test was found to be .80. As a result of the item analysis, item difficulty was determined to be between .67 and .94, with a mean difficulty of the items of .83. Items having less than .24 item difficulty were eliminated from the test in order to develop the final form of the SAT. The sample item provided illustrates typical test items. *Multiple-Choice Question:* Melih smeared some particles onto the piece of bread and put the bread into a jar. After two or three days, he saw some cotton-like structures on the bread. Which one of the living things could cause these structures? (i) Bacteria (ii) Protista (iii) Fungi (iv) Viruses The ASTS, developed by Sahin, Çakır, and Sahin (2000), was administered to measure students’ attitudes toward science (reliability = 0.95). The Likert-type scale has 27 items with four dimensions (interest, like, importance, and fear) developed from factor analyses. Students were required to indicate their agreement on a 5-point response scale going from 5, strongly agree, to 1, strongly disagree. The findings of the study revealed that there were significant differences favoring the case study approach on students’ achievement and attitudes towards science. The experimental and comparison groups’ previous learning about the topics in the *Viruses, Bacteria, Fungi, and Protista* unit and their prior attitudes toward science were assessed using two pretests (SAT and ASTS). The means and standard deviations of the pretest and posttest results are presented. The pretest means for the two groups were tested using two-group *t*-tests to explore whether the two groups were similar at the beginning of the study. The results indicated that no significant differences were found between the experimental and the comparison group in terms of achievement about the topic (*t* = 0.411, *p* > 0.05) and attitudes toward science as a school subject (*t* = 1.276, *p* > 0.05) at the beginning of the treatment. Therefore, it was decided to use the posttests as indicators of
instructional effects. Statistics (t-test) were used to compare the effectiveness of two different instructional methods on the achievement and attitude results obtained from the posttest scores after the treatment. The results indicated that there was a significant difference between the achievement of students in the experimental group and of the students in the comparison group ($t = 6.223, p < 0.05$). Higher mean scores demonstrated by the experimental group indicated that the students taught by the case study instruction scored significantly better than students taught by the traditional instruction. In addition, there was a significant difference between posttest attitude mean scores of the students taught with the case study instruction and those taught with the traditional instruction ($t = 4.841, p < 0.05$). Posttest attitude mean scores revealed that the students taught with case study instruction got higher scores than the students taught with traditional instruction. The statistical results were supported by the reflections of comparison and experimental groups’ ideas about the instructional treatment. Students in the experimental group demonstrated positive attitudes in their reflection letters. For instance, one student stated that he felt science was not boring when science topics were selected from life itself; however, students in the comparison group generally expressed their negative attitudes toward the science course. For example, one student stated that he was frustrated about science. These responses appear to suggest that case study instruction could help improve students’ attitudes toward science.


The objectives of the study was to answer the question: How do students experience learning from Smart Board technology by teachers using a converted PowerPoint lesson?

The sample comprised of included one veteran Biology teacher, one experienced Physics teacher, and students from two of their classes. Students in this study represent diverse backgrounds that can be found at most high schools. This study is based on the qualitative interpretive case study model and was conducted in a central North Carolina high school. This research study consisted of three phases. The first phase consisted of teacher pre-lesson interviews and teacher training sessions with the researcher to learn how to convert PowerPoint to SmartBoard. In the second phase the participating teachers lead lessons and the researcher carefully collected
data on engagement through participant observation. Classes were observed through a classroom observation scale protocol. Additionally, focus groups with participating students were held at the school. Lastly, the third phase consisted of post-interviews with participating teachers. Research activities are described as Phase 1 (1) Pre-lesson teacher interview Phase 2 (1) Teacher led lessons (2) Student focus groups Phase 3 (1) Post-lesson teacher interviews This observation protocol examined four aspects of the research question: learning activities, engagement levels, cognitive thinking levels, and learning directors. Learning activities were scored using the observation protocol scoring chart. Engagement was measured by the percentage of attentive, on task and responsive students. Cognitive levels were calculated by observing the level or order of thinking occurring, using Bloom’s taxonomy. Learning direction was determined by evaluating who directed learning in the classroom, teacher or student.

The findings of the study were: Engagement. The classroom observation scale protocol revealed that at least eighty percent of students were actively engaged for the entirety of the lessons. This was determined by observing students’ attentive, on task, and responsive behavior every five minutes throughout the lesson. During observations, students remained attentive to the teacher and the student at the board. In the physics classroom students sat attentively and most were totally focused on the student at the board. In a sign of attentiveness, some students moved forward in their chairs to see what other students were writing. Students indicated their high level of engagement during the lesson was due to the interactive properties of SMART Board. In a biology classes’ focus group interview a student responded that they “felt engaged, and the lesson was interactive and I felt apart of the lesson.” Another student suggested that novelty played a roll in her engagement stating “you were not use to it (SMART Board), but it helped you remember it.” Some students commented how the interactive features of SMART Board engaged them. Students commented: “The lesson was more interactive. People sometimes slack off in PowerPoint, but with SMART Board it is more interactive, and draws people in.” Learning activities. Six main learning activities occurred during the SMART Board lesson: class discussion, student presentation, lecture with discussion, technology – student use, questioning by the teacher and student response Learning director. Both biology and physics classes began with the teacher directing most of the learning at level two, however, as each lesson progressed the learning director gradually moved from level two to level four. In this case the learning direction progressed from being mostly teacher directed to
mostly student directed within fifteen minutes of starting the lesson. By the end of each class students presented much of the material and read aloud their answers. Students also noticed the shift in learning direction. Students responded that the main difference between PowerPoint and SMART Board in the biology class was: “In SMART Board we wrote our own notes, and filled in the blanks, and focused more on the concepts than just writing notes. The teacher had to wait on us before she could go to the next slide, in PowerPoint we are just trying to keep up with her.” During physics lessons, students were seen presenting the material and the teacher acting as a facilitator of the lesson. Another common theme throughout the focus group interviews was a sense of ownership in the lesson. “With SMART Board it was more interesting, you can’t write on PowerPoints, but with SMART Boards you could put in your two cents worth.” 

**Cognitive activity.** Higher levels of conceptual understanding, beyond remembering and understanding on Bloom’s taxonomy levels, were incorporated during the SMART Board lessons. Throughout the lessons students were observed answering questions that suggest high level thinking orders, such as creating and applying concepts. However, in both physics and biology classes higher order questioning and thinking occurred later in the lesson. After the SMART Board lesson, the Biology teacher responded that, “students seemed to understand the information from what I gathered from my assessment, so I would say they have a higher level understanding of the information.” Students also identified their conceptualization during the focus group interviews: “When we take notes from PowerPoint there are just a bunch of bullets, and we just scan for information, but SMART Board makes you think about what you write.”

**Beamer T., et al., (2008)** had studied Lasting Impact of a Professional Development Program on Constructivist Science Teaching. The objectives of the study were: to examine the effectiveness of the GK-12: Lowcountry Partners for Inquiry program that included an emphasis on constructivist teaching methods for science teachers and science graduate students. The goal was to monitor middle school teachers’ use of constructivist practices in their classrooms two years after their last program experience. Classroom observations, Constructivist Learning Environment Surveys (CLES), and interviews were conducted to assess their use of constructivist practices.
The sample comprised of Four teachers who completed 225 hours of professional development in constructivist teaching methods in a three-year program at the College of Charleston (CofC) were studied two years after completion of the program. The program focused on the five parameters of constructivist learning and teaching through courses taught in collaboration with the Medical University of South Carolina (MUSC). Graduate fellows from CofC and MUSC paired with teachers in the Charleston County School District (CCSD) to create lessons that modeled the constructivist methods they were taught in the program. Teachers were able to enter the graduate fellows’ laboratories to gain hands-on experience and a real-world perspective of the science they teach. The roles were also reversed as the fellows entered the teachers’ classrooms and used the methods to convey the types of practices and information the fellows use in the field. The fellow/teacher pair videotaped lessons they taught and then watched and discussed their teaching in the course in which close attention was paid to the constructivist methods they had learned earlier. The teachers who were selected for the program teach in the CCSD that is a large, primarily urban school district. The partnership between the colleges of graduate studies at the CofC and MUSC was supported. Data suggest that teachers’ use of constructivist practices increased following completion of the GK-12 program. Scores in each of the five CLES categories were significantly higher two years post program involvement than at the end of the program (p < 0.05). Teachers reported that they not only continued but also increased their use of constructivist practices because of the increased achievement and improved critical thinking skills of their students.

The Constructivist Learning Environment Survey (CLES) (Taylor, Fraser, & White, 1994) was used to rate the teachers’ use of constructivist practices in the classroom. The CLES evaluates the five parameters of constructivist teaching described earlier. The CLES consists of 35 questions, seven of which are allocated for each of the five parameters. The score range is five to 35 per parameter. The average score per subscale is 18, and it represents that the person “sometimes” felt they were using this tactic when teaching. A scale which offers five choices from one being “not at all” to five being “always” generates the scores. The CLES survey has been recognized throughout the education community as an excellent measure of constructivism in the classroom. The Cronbach alpha values for each parameter are as follows: personal relevance = 0.81, scientific uncertainty = 0.54, critical voice = 0.79, shared control = 0.85, and student negotiation = 0.68 (Taylor et al., 1994). Alpha values
indicate the consistency of responses made to items within a parameter. The greater the consistency, the higher the alpha values, with 1.0 being the maximum. Detailed field notes were also collected based on what was observed in each classroom. Finally, an interview was conducted with each teacher to gain deeper insight about each teacher’s use of constructivist teaching practices in their classroom. Each of the four participants’ classrooms was observed for a total of eight hours to help ensure that the scores were reflective of practice. The observer was trained in the observation of use of constructivist techniques (CLES) in the classroom by the principal investigators. The observer took extensive field notes of each classroom encounter. After eight hours in each classroom, the observer completed a CLES of the teacher based on the observations. The observer’s CLES scores were a control to ensure the accuracy of the self-report. Each teacher also filled out a CLES examining their own use of constructivist teaching practices throughout the school year. Allowing teacher self-assessment was introduced to eliminate potential observer bias. The teachers themselves likely have a better perspective of their routine use of constructivist teaching methods. One problem with self-reporting is the potential for inflation of scores. After the CLES post program was completed for each teacher, their scores were compared to their scores on the CLES at the immediate conclusion of the program. An interview was conducted with each teacher after completion of the classroom observations and CLES questions were asked pertaining to the following: (1) the use of constructivist teaching practices, (2) student achievement each teacher perceived as related to the use of constructivist teaching practices, and (3) the amount of professional development each teacher had received in constructivist teaching methods since the GK-12 program. After the initial data were analyzed, a second interview of the teachers was conducted to clarify the results. Data are presented as mean +/- Standard Error of the Mean. The Wilcoxon Rank-Sum test, appropriate for the small sample size, was used to compare current mean CLES scores with the mean scores at the immediate conclusion of the program. This test is powerful, less sensitive to outliers than the two-sample t-test, and does not assume a normal distribution (Lam & Longnecker, 1983).

The findings of the study were: Summaries of the CLES data for each of the four teachers on each of the parameters include end of program, two years post program, and outside observer values. The average CLES score for the four teachers from the end of the program and two years post program. Teachers’ use of
constructivist teaching methods increased following the conclusion of the GK-12 program. CLES scores for all four teachers were higher after two years than at the immediate conclusion of the program (p < 0.05). Personal relevance, scientific uncertainty, critical voice, shared control, and student negotiation all showed a significant increase (p < 0.05). Mean teacher scores determined by outside observation as well as self-assessment improved after the conclusion of the program.


The objectives of the study were to provide a picture of the role of Moodle for secondary school language teachers rather than making generalizations with regard to the use of Modular Object-Oriented Dynamic Learning Environment (Moodle).

The sample comprised of 20 participants. All 20 teachers were the foreign language teachers in TFS. Interviews were held in groups of 3 or 4 based on the availability of the teachers. Both structured and unstructured interviews were used in order to get more informed about their experiences with Moodle. With the rapid advances in technology, several online learning tools come onto the stage. Being an online learning delivery tool to support a full range of teaching and learning activities conducted by educational institutions Moodle facilitates online content creation and collaboration by entailing various social and communication tools that support teacher-student, student-student, and teacher-teacher interactions. This paper presents the "Moodling" (Moodle, 2005) experience within a secondary school in a developing country, namely Turkey. Based on a focus discussion group with the foreign language teachers, the author depicts the critical points that need to be taken into consideration so that an effective collaborative online platform for both teachers and students to learn together can exist. METHODOLOGY The participants were all the foreign language teachers in TFS totaling a number of 20 teachers. Interviews were held in groups of 3 or 4 based on the availability of the teachers. Both structured and unstructured interviews were used in order to get more informed about their experiences with Moodle. According to Patton (1982), the fundamental principle of qualitative interviewing is providing a framework within which respondents can express their own understandings in their own terms and therefore for which open-ended, rather than closed, questions should be used as far as possible (Patton, 1982). Patton’s style of qualitative interviewing is referred to as the standardised open-
ended interview’, through which questions are asked in the same way and order, with a minimum of probing by the interviewer (Patton, 1982). Use of probes were preferred by the researcher in order to allow the informants to answer more on their own terms (Patton, 1982), so the interviewer seeking at the same time both clarification and elaboration on given answers was more free to probe beyond answers (Patton, 1982). Using a combination of interviews and questionnaires, the following research question was tried to be answered: “Which benefits does Moodle provide for foreign language teachers within the context of a developing country?”

The findings of the study were: The findings are not exhaustive since the statements presented in this study include contextualizing and interpretation by the researcher based on a single case study within a developing country. One must bear in mind that the statements presented in this study include contextualizing and interpretation by the researcher based on a single case study within her country, since the aim of this research is not generalization but to provide a picture of the role of Moodle for secondary school language teachers. The most important conclusion derived from this research is that all the secondary school teachers interviewed stated their willingness to participate in a virtual learning environment in addition to the traditional methods of teaching. So, they would like to embed the ICTs as a learning tool into their teaching process despite both the lack of the required training and the infrastructure. So, the necessary resources and facilities to use the computer as just another teaching tool must be provided in order for these teachers to adopt the dual role of both content developer and coach. Since only the foreign language teachers in one school participated in this study it would be difficult to claim whether all the teachers in the school would show the same willingness. Furthermore, the major benefits of Moodle realized by the teachers so far can be summarized as a collaborative online platform for teachers and students to learn together. The teachers also stated that through the interactions of their students with both the teachers and their peers constructivist learning has been realized. In terms of the implications for other cultural settings, it would be difficult to state that the same results may be obtained in other developing countries with similar technological infrastructure. One of the reasons for this difficulty is as Warschauer and Meskill (2000) argued “the key to successful use of technology in language teaching lies not in hardware or software but in humanware”. Unless online learning involves social negotiation and culturally relevant content for the learners whereas teachers act as facilitators of their learning
and encourage multiple perspectives, the social-constructivist role of Moodle may not be realized. As the rapidly growing interest in Moodle within the e-learning community especially around the developing world, it would be unwise to ignore its pedagogical impact.

Wessa P. (2009) had studied How reproducible research leads to non-rote learning within socially constructivist statistics education.

The hypotheses of the study were: (1) H0: the number of submitted (verbal) feedback messages (about the workshops of peers) is not associated with exam scores. (2) H0: the number of received (verbal) feedback messages (about the student's workshops) is not associated with exam scores.

The sample comprise the two different student populations: 111 Bachelor students, and 129 “Switching” students who already have a professional bachelor degree and registered for a (mandatory) preparation program before switching to an academic master during the fall semester of 2007. The program of study for both populations involves applied economics and business courses. Statistics is treated as an important and compulsory subject because students are required to engage in empirical research in later years (Bachelor thesis and Master thesis).

The findings of the study were: It is clear that the first hypothesis should be rejected for both student populations. The p-values are extremely small which leaves no room for doubt. The results are preliminary and do not provide proof of a causal relationship. However, for the purpose of presenting the new e-learning environment, it represents a very strong indication that the creation of the Compendium Platform was a good investment and that a detailed analysis of the database in future research is well worth the effort. Second hypothesis should not be rejected unless a high type I significance threshold is employed. Depending on the actual cut-off points that define the categories, the p-value for the Switching students might fall (slightly) below the 5% level. The p-value for the Bachelor students however, never falls below a two-digit percentage.

Özdilek Z. and Özkan M. (2009) had studied the effect of applying elements of instructional design on teaching material for the subject of classification of matter.

The objectives of the study was to examine the effect of the design of instructional material for the subject of classification of matter as solids, liquids and
The sample comprised of 120 students in the 7th grade (experimental group 1=30, experimental group 2=30, control group 1=30, and control group 2=30). The study was conducted in the 2004-2005 school year. In this study, a pre-test/post-test with control group experimental design was used. The study was conducted in the fall semester of the 2004-2005 academic year. The participants of this study were 120 seventh grade students in four classes. There were 30 students in each of the two control groups. Each of the first and second experimental groups were also made of 30 students. The overall gender division of the participants was 51% girls (n=61) and 49% boys (n=59). In order to investigate the effectiveness of instructional design when the materials were used by the different instructors and to eliminate the bias of the researchers in the current study, a researcher taught the topic to the first control group (I) and second experimental group (IV). A science teacher in the school taught the topic to second control group (II). A different science teacher in the school taught the topic to the first experimental group (III).

Development of Instructional Design

Various models of instructional design have been described. It has been suggested that these models tend to have four common components (Zheng & Smaldino, 2003). Learner Considerations, Content organization, Instructional strategies (Engagement Phase, Exploration Phase, Explanation Phase Elaboration Phase, Evaluation phase and Formal Evaluation) and Measurement Tools Four data collection tools were used in this research. Data collection tools were 1. Prior knowledge test, 2. Science Attitude Scale, 3. Multiple Intelligence Fields Determination Survey and 4.Achievement Test. The data were analyzed with descriptive statistics, one way ANOVA, variance homogeneity, Cohen’s effect size, and Scheffe Tests using the SPSS 11.00 program at .05 significant levels. After the study, it was found that there were significance differences between the achievement test scores of students in the two experimental groups when compared with the two control groups using the one way ANOVA.
test \((F (3, 116) = 27.912 \text{ and } p < .05)\). Following the ANOVA test (because of the homogeneity of variance tests \(p\) values > .05) a Scheffe test was conducted in order to determine which groups have significance differences. The test results revealed that levels of achievement of the learners in the two experimental groups were higher than both of the control groups. However, there were no statistically significant differences among the two experimental groups and among the two control groups.

The findings of the study showed that the instructional design is highly effective since, as suggested by McArdle (1991), an efficient instructional design greatly increases students’ success. The holistic instructional design approach included deliberate integration of multiple teaching methods to improve the success, multi-faceted instructional materials prepared for the topic and supporting the instruction further by the use a computer animation. The result that we attained in our study is consistent with the suggestions of Joseph and Gayle (1998), Powell and Wells (2002), and Mahajan and Singh (2003) that more than one teaching method should be used in instruction. It resonates, too, with researchers who argue that learners’ characteristics and needs must be considered in instruction, that media such as computer animations should be used in instruction, and that instruction should be designed according to design principles. This study indicates that the holistic instructional design approach, which addressed all of these dimensions, supported the students in the experimental group to be more successful compared to the ones in the control group. In sum, it can be said that if instructional materials on other topics in science were prepared in a way that integrates elements of multiple effective teaching methods and according to the design principles such as emphasis, effective colors, use contrast and lines balance the teaching is likely to be more effective.

**Gainsburg J. (2009)** had studied Creating Effective Video To Promote student-Centered Teaching.

The objectives of the study was to train the pre-service teachers (PSTs) to place students at the center of their lesson planning; to realize the necessity of ongoing, informal assessment; and to recognize the pervasiveness of student misconceptions and the importance of uncovering and addressing them.

The sample comprised of sixteen out of the seventeen PSTs enrolled in the 2006 course participated in both the pre- and post course activity.
The findings of the study were: these video segments were invaluable and made the 2006 iteration of the methods course the smoothest and clearest of the three times investigator has taught it. Major course concepts, such as the importance of listening to students and monitoring their understanding, student autonomy, cognitively high-level tasks, and the benefits of collaborative work, were far easier to convey with concrete examples. The video allowed me to teach in a constructivist manner (consistent with the way investigator urge his PSTs to teach), in that it allowed the PSTs to build their own understanding of each concept through the analysis of real classrooms rather than having to accept my definitions. Overall, investigator believes the video offered this year’s PSTs the advantages of professional video but overcame its shortcomings. Assessing what his PSTs learned as a result of this video is, of course, harder than assessing how easy it made his job of teaching the course. Small enrollment numbers in the course (around 20 each year) make it difficult to distinguish the impact of the video from personal characteristics of the PSTs in each class. Below, investigator draw on three data sources to suggest the video had the desired impact. Those were: 1) class records (formal and informal) of grades, attendance, and participation, 2) a video-analysis assessment, and 3) PST self-report.


The objectives of the study was to apply a networked learning model to the student construction of personal learning environments as a means of facilitating digital literacy and inquiry learning. This first-iteration design captured the nature of the personal learning environment, documented apparent patterns, and considered implications for future instructional design. It sought to answer the question, what are the processes that students go through as they design a personal learning environment in a middle school science class? The concept of a personal learning environment (PLE) has been gaining support in the eLearning domain to broadly refer to “how people construct the environment for themselves: the tools they choose, the communities they start and join, the resources they assemble, and the things they write” (Wilson, 2008, p.18). Personal learning environments are “systems that help learners take control of and manage their own learning” (Downes, 2007, p. 24). The seventh grade students in this study were networked learners in training. They used
personal pages with API widgets to access, organize, and synthesize content in support of scientific inquiry into poisonous and venomous life forms. In this case, managing learning and individual control were scaffolded over time to allow the students to learn the processes and tools required to support their learning objectives.

The sample comprise of 96 seventh grade science students from 5 classes. A mixed method, design-based research case study was conducted to determine the processes students go through when constructing personal learning environments for scientific inquiry. Typically, design-based research is a lengthy process spanning numerous design iterations.

The findings of the study were: The following process themes were identified through coding of case study data. Practicing digital literacy, practicing digital responsibility, organizing content, dealing with technology, collaborating and socializing, synthesizing and creating, taking responsibility and control for learning. As a result, models evolved in which various tools were applied. Based on the findings of this study and the value of guided instruction (Mayer, 2004) in an open learning environment (Clarebout & Elen, 2007), the teacher is challenged to develop a design that strikes the delicate balance between structure, guided instruction, and student directed inquiry. Again, the goal of personal learning is to empower the student to independently construct rich, effective networks in support of his or her learning objectives. Effective independent inquiry does not happen automatically (Mayer, 2004). This design-based research study further indicated that direct instruction, guided inquiry, exposure to numerous tools, and practice provides a foundation on which a future of independent personal learning is built. Consideration of the networked student diagram informs next iteration designs and offers a structured approach for instructional and student designers.


The objectives of the study were: (1) To determine whether teachers aimed to create scope for collaborative learning through assignments; (2) To determine the reference of students towards individualized/ teamwork.

The sample comprised of 72 students and 24 teachers of 12 schools of New Delhi. Descriptive method was adopted, whereby data collected through a survey were interpreted. Twelve senior secondary schools of Delhi, affiliated to the Central
Board of Secondary Education (CBSE) of India were selected. 24 teachers (two from each school) teaching in the upper primary level were included. Six students of the IX grade of each school were included so as to collect data on the assignments carried out by them in the previous academic year i.e. when they were in the VIII grade. There were thus 72 students. Assignments given in English, Science, Social Science, and Math in which students were required to use ICT for data collection and processing were only considered. The following tools (constructed by the author and finalized with the help of ten teachers of schools and University, Department of Education) were used for data collection: • Questionnaire: for data collection from students with a set of closed and open-ended questions (requiring brief answers). All the filled in questionnaires had been received, as there was direct/indirect acquaintance with students. The respondents were in the age group of 14-16 years. There were 40 male respondents and 32 female respondents. • Interview: An interview schedule was used for interviewing teachers. Interview was held mainly for corroboration (triangulation) of data collected through the questionnaire. The teachers were in the age group of 28 years to 43 years. 18 of them were female and only 6 were male. They were all postgraduates.

Limitation of the Study

The schools, students and teachers were selected in a non-random manner, on the basis of direct/indirect acquaintance. Hence, the findings may not support generalizations.

The findings of the study were:

Nature of assignment: the schools selected for the study being affiliated to the CBSE, perhaps led to common areas being selected for the projects. These areas were environmental sciences, role of International bodies such as the United Nations and its constituent bodies, UNESCO, WHO, and UNICEF; freedom movement of India; biography and contributions of scientists, mathematicians, literary figures, social reformers and statesmen; health and hygiene; cultural heritage of India; book review (only on popular English novels appropriate for children).

Source of information for the assignments: The Internet (World Wide Web) was the first choice of all the respondents. The other sources mentioned were the newspaper, television, reference books and text books.

Information processing:

From the response to the items seeking information on the major steps taken for preparing the assignment, the following information was obtained:

Access to ICT: 72% of the students had computers at home but only about 48% could access the Internet from home. Students without such direct access said that they visited cyber cafes and other places with the required facilities. Skills for word processing and
using the Internet: All the students possessed basic skills -word processing, preparing power points and using the Internet. 92% of the students used social networking sites. None of them had used web (wikis, blogs and twitter) for creating/editing content. Collaboration: Only 15% of the assignments were meant for teamwork. But the students had discussions with their peers regularly even for the assignments meant for individual work.


The objective of the study was to imbue students with multimedia project development skills over a 14-week trimester, which culminated in an interactive group project that was multimedia and authored in Macromedia Director.

The sample comprised of 53 students (N=53) in their 2nd year of the degree course. They consisted of students from the Faculty of Management, the Faculty of Information Technology and the Faculty of Engineering enrolled in the Interactive Multimedia course for their Bachelor of Multimedia degree. In order to complete above assignment, the students were given an authentic task, i.e. they were to develop an interactive multimedia application/prototype based on the theme “Malaysian Culture” for the Malaysian Tourism Board by the end of the trimester. The presents a research study that was conducted in the Faculty of Creative Multimedia, Multimedia University, Malaysia, to investigate students’ perceptions in developing a multimedia project within a constructivist-based learning environment. Students worked in groups to create an interactive multimedia application using an authoring tool, and were solely responsible for every project development decision. They were then given a survey and asked for their comments and feedback to elicit their perceptions and attitudes towards this learning environment. A factorial analysis was performed on the survey and results showed that 5 factors influenced students’ perceptions in developing a multimedia project within a constructivist learning environment. Multiple regression analysis further showed that motivation played a significant role in students’ perception towards developing a multimedia project in this learning environment.

The findings of the study were further supported by their survey comments and feedback. Results of the study showed that by setting an authentic task, via a
multimedia project, into a constructivist learning environment, students became highly motivated learners and active in their learning process and provided strong support and encouragement for Malaysian educators to incorporate multimedia technology and constructivist learning into their classrooms. In order to measure students’ attitudes and perceptions towards developing a multimedia project, a survey questionnaire was administered to the students at the end of the course. The items were measured on a 5-point Likert scale, and with 1 = Strongly Disagree, 2 = Disagree, 3 = Undecided, 4 = Agree and 5 = Strongly Agree. In particular, the objective of the survey was to gauge students’ perceptions in working on a group-based multimedia development project. The items of the survey were further reduced using a factorial analysis in SPSS 11.0 with a Cronbach Alpha coefficient of 0.9106, which is considered a good internal consistency and reliability value (Lim, Khine, Hew, Wong, Shanti & Lim, 2003). A factor analysis was performed and yielded 5 significant factors with means of over 3.5, students “Agreed” or “Strongly Agreed” with the items on the survey. These factors were also significantly correlated with multimedia development. These 5 factors were classified as the following: 1. **Teamwork and collaboration.** This factor contained items that measured students’ perceptions towards working together in a group and their collaborative effort in completing their multimedia project. 2. **Motivation towards the project.** This factor contained items that measured students’ motivation, satisfaction and enjoyment attitudes towards their project. 3. **Increased and enhanced learning skills.** This factor contained items that measured students’ perceptions towards the skills they acquired during the development of the project. 4. **The learning environment.** This factor contained items that measured students’ perception toward this multimedia-mediated constructivist-based learning environment as a whole. 5. **Application of skills acquired.** This factor contained items that measured students’ attitudes toward applying their acquired skills to the real-world.


The objectives of the study was to explore the effects of constructivist learning environment on prospective teachers’ opinions about “mathematics, department of
mathematics, discrete mathematics, countable and uncountable infinity” taught under the subject of Cantorian Set Theory in discrete mathematics class

The sample comprised of 60 first-year students in the Division of Mathematics Education at the Department of Science and Mathematics in Buca Education Faculty at Dokuz Eylul University were divided into two homogenous groups. In order to do this segmentation, Minimum Requirements Identification Test was developed and used by the researchers. This test includes concepts like “set”, “correlation” and “function”, which are required to understand Cantorian Set Theory. While the control group was taught by traditional methods, a teaching method based on a constructivist approach was applied to the experimental group. Data were gathered by an open-ended questionnaire administered to total 40 students, 20 from each group. Collected data were evaluated through content analysis. In the end, despite the minor differences, no statistically significant difference was found between the opinions of control and experimental groups about mathematics ($\chi^2$ calculation=2.578, $SD=3$, $p>0.05$), department of mathematics ($\chi^2$ calculation=3.185, $SD=3$, $p>0.05$) and discrete mathematics ($\chi^2$ calculation=4.935, $SD=3$, $p>0.05$) after the instruction. However, opinions about Cantorian Set Theory were significantly differentiated between experimental and control groups after the instruction ($\chi^2$ calculation=13.486, $SD=2$, $p<0.05$).

2. Methods This study is based on an experiment. Prospective mathematics teachers were divided into two groups and Cantorian Set Theory was introduced to them by using two different methods: traditional teaching method and method based on a constructivist approach (MBCA). Both at the beginning and the end of instruction, the opinions of each group were gathered via student opinion questionnaire (SOQ) and the effects of constructivist approach on their opinions have been assessed after evaluating the results through the content analysis. This research methodology is in line with the interview technique constructed on qualitative research methods. Constructivist interview technique has structural similarities with questionnaires or attitude indexes in which participants have responded to the questions in specific categories (Türnüklü, 2000). Here, the purpose is to identify similarities and differences between participants by comparing them (Yıldırım & Şimşek, 2000). The researcher asks the same questions to each participant in the same manner with the exact wording. The answers of participants are close-ended. Hence, constructed interviews produce quantitative results similar to questionnaires. However, in this research, questions were asked in written and answers were also
taken in written form, not verbally. Then, opinions, those under four headlines in the form, were categorized. This operation was important, since it was a process of simplification, summarization and transformation through reducing data, selecting the essential parts of abundant raw information and focusing on specific points. Subjects First-year students of mathematics education at the Department of Science and Mathematics in Buca Education Faculty at Dokuz Eylul University participated to this research. The study has been conducted with an experimental group of 30 students and a control group of 30 students. In total 40 responses to the questionnaire, 20 from each group, were evaluated. Minimum Requirements Identification Test (MRIT), including concepts like “set”, “correlation” and “function”, which are required to understand Cantorian Set Theory, was used in order to designate experimental and control groups. The students were graded in a descending order according to their level of success, and the groups were formed by selecting one student after another, the first student was assigned to the first group, the second to the second, third to the first and forth to the second and so on. Then, one group was set as control group, the other as experimental group by random selection. After administering SOQ to both groups, the researcher taught the subject to the students. Subsequent to the instruction, the opinions of both groups were collected through SOQ once more. In the control group, traditional and formal instructional methods were used, with time-to-time question-and-answer and whole class discussion sessions. Analyses of data Data were analyzed by using qualitative research methods. $\chi^2$ compatibility test was used in order to test the difference among the categories

The findings of the study were; there is no significant difference in the opinions of both experimental and control groups, pretest and posttest, in regard to the categories of “mathematics, department of mathematics and discrete mathematics”. This indicates that short term applications do not influence students’ deep-rooted opinions significantly. Besides, students do not believe the necessity of mathematics since they cannot correlate mathematics with other sciences and life. Nevertheless, this circumstance has not changed significantly before or after the instruction in both experimental and control groups and this is thought-provoking fact considering that these students are specially selected for the Department of Mathematics. As for mathematics, which can be regarded as life itself, this result might be an indicative of the fact that mathematics has not been taught by reasoning but by heart in elementary and high school education. According to the qualitative results, students do not find
Department of Mathematics fun and they regard it very difficult. In spite of this fact, the percentage of students who are happy in their department is quite high. This result shows that availability of job opportunities after the university influences the students’ choice of department to a great extent. In contrast with the control group, the number of students who find mathematics fun increased in the experimental group after the instruction. It can be said that applied method enhanced the motivation of students. In both groups, the number of students who think that discrete mathematics is fun and requires reasoning, increased after the instruction. This might indicate that the numerical equivalence could be an important subject which may influence the students’ views about discrete mathematics. Furthermore, after the instruction, the number of students who regarded discrete mathematics difficult and complicated increased in the experimental group. That is to say, the students in experimental group comprehended the depth of discrete mathematics. When students’ opinions about numerical equivalence are examined, significant differences are found between experimental and control groups. While students in both groups stated that they had no opinion about numerical equivalence before, this has changed after the instruction. The number of students who found the subject fun is higher in experimental group, while students in the control group found it difficult and nonsensical. This is a pleasing result, since it can be taken as another indicator of the efficiency of applied method. Moreover, students’ special reference to PDL, which was used for the research, makes us think that PDL can also be a method for teaching mathematics, a method that students may accept and prefer. Different research results also showed that PDL increased the motivations of students and could be used for teaching mathematics (Feikes, 1995; Torp & Sage, 2002; Roh, 2003; Hämäläinen, 2004; Hmelo-Silver, 2004; Javier & Cepeda, 2005; Günhan, 2006; Özgen, 2007; Özgen & Pesen, 2008).

Summary of all twenty two researches in terms of author, year, dependent variable (if present), experimental design and sample is presented in Table 2.2.
### Table 2.2
Summary of past experimental researches related to the study

<table>
<thead>
<tr>
<th>No.</th>
<th>Author(s) and Year</th>
<th>Dependent Variable</th>
<th>Experimental design</th>
<th>Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Kim J. S, 2006</td>
<td>Academic achievement of the students</td>
<td>$T_1X_1T_2$ $T_1X_2T_2$</td>
<td>76 6th grade students</td>
</tr>
<tr>
<td>2.</td>
<td>Hidir karaduman and dr. Mehmet gültekin 2007</td>
<td>Students’ attitudes, success and Retention in social studies.</td>
<td>$T_1X_1T_2$ $T_1X_2T_2$</td>
<td>72 5th grade students from Eskişehir.</td>
</tr>
<tr>
<td>3.</td>
<td>Uğur taşdelen fitnat köseoğlu 2008</td>
<td>Alternative text on acids and basis</td>
<td>$T_1X_1T_2$ $T_1X_2T_2$</td>
<td>80 chemistry trainee teacher at Gazi University in AnkaraTurky.</td>
</tr>
<tr>
<td>4.</td>
<td>Nurettin yorek1, halil aydın1, ilker ugulu1, yunus dogan 2008</td>
<td>Concepts related to classifying living things,</td>
<td>$0X_1T_2$ Interviews</td>
<td>191 9th grade students and 7 Biology teacher in Turky</td>
</tr>
<tr>
<td>5.</td>
<td>Olgun O. and Adali B. 2008</td>
<td>Effects of a case study approach on students’ achievement and attitude</td>
<td>$T_1X_1T_2$ $T_1X_2T_2$ Interviews</td>
<td>88 5th grade students</td>
</tr>
<tr>
<td>6.</td>
<td>Dr. Zehra özdilek prof. Dr. Muhlis özkan 2009</td>
<td>Effect of the design of instructional material for the classification</td>
<td>$T_1X_1T_2$ $T_1X_2T_2$</td>
<td>120 7th grade students</td>
</tr>
<tr>
<td>7.</td>
<td>Julie gainsburg 2009</td>
<td>Effective Video To Promote Student-Centered Teaching.</td>
<td>$T_1X_1T_2$ $T_1X_2T_2$</td>
<td>16 pre service teachers</td>
</tr>
</tbody>
</table>
8. Narli S. and Baser N., 2010

<table>
<thead>
<tr>
<th>Mathematics teachers’ opinions</th>
<th>T1X1T2</th>
<th>T1X2T2</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 first-year students in the Division of Mathematics Education</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Where,  
0 = No Pre-test (T1)  
T2 = Post-test  
X1 = Experimental Teaching and X2 = Traditional Teaching.  
E = Experimental group and C = Control group.

2.3 SIGNIFICANCE OF THE PRESENT STUDY

After review of the related literature and researches, some significant points related to the present study have been noted are given below:

In the present study Constructivist instructional program was developed based on the principles of constructivism. This can be considered a unique aspect of the study because a lot of theories are available on constructivism globally but very limited studies were found on implications of constructivism in classroom practices.

The topic for CIP “animal classification” was selected from textbook.

Majority of the studies were conducted at pre-primary, primary and higher secondary level, were as secondary level studies on constructivism are limited in number.

Many studies deal with Constructivism/Constructivist approach as a separate process and aimed to develop separately, but here researcher had decided to compare its effectiveness with traditional teaching approach. On the basis of effectiveness as compared to traditional teaching we can think of a replacement option of traditional teaching approach or make corrections in it.

As compare to other researches, experimental researches are less conducted on constructivism.

The trend of the researches in this area showed that it has attracted researcher. During most recent years, the researches in this area of Constructivist approach, its importance in education and its role in achievement have proved their importance in the field of education. Therefore, the researcher also took his problem in this area.

In the previous studies, various variables have been studied to see their relations with constructivism, achievement. Among them sex, age, study skills,
mental ability, culture, self-efficacy, stream, instructional design, personality, were studied more frequently.

In the present study, Educational achievement was taken as dependent variable and Instructional program (at two levels Constructivist instructional Program and Traditional teaching) was taken as independent variable. Thus, the present study was aimed to study the Effectiveness of Constructivist Approach to the Teaching of Animal Classification in Science and Technology of Standard Ninth.

In previous researches were conducted in the subjects like biology, mathematics, science, language, social studies, English, botany, medical, music, while the present study was conducted on science subject especially Animal classification from Zoology. In past experimental researches, the size of sample was huge variation in terms of students, teachers, articles, trainee teachers, models, etc. The sample of the present study total 140 students includes girls and boys. The present study was at secondary school level. In present study experiment was conducted in CBSE Schools.

In past researches had pre and post test design factorial design, Ex-post facto design, correlation, causal-comparative study, while in the present study, purposive two groups only post test design was used.

Most of tools used in the past researches were ready –made, only few of them were developed by the researcher. Whereas, in the present study, Constructivist Instructional program which correlated to constructivist teaching (with 20 PPT presentations), Post test, Opinionnaire and Interview scadule were developed and post test was standardized by researcher himself. Pre-achievement were taken as co-variants, so for measurement of that these types of tool were used. For measurement Pre-achievement, final annual test was used which was developed by the respective school teachers and for measure science achievement, science achievement test (Post test) which developed by researcher was used.

These statistical techniques mean, SD, t-test, ANOVA, MANOVA, regression, correlation and Chi-square were used in the previous studies, whereas in the present study mean, SD and t-test and Man-whitney U test were used.

1. The researcher has developed CIP and achievement test for unit animal classification for high school students of class nine.
2. To measure the achievement after the treatment the teacher made test was used as a research tool.
3. It was not possible to make equal groups regarding the IQ, study habits and other psychological variable. So groups were made statistically equal, by using pre-achievement of the students.

4. The researcher conducted the experiment of the study in Rajkot city. The study was carried out particularly in secondary schools.