CHAPTER II

REVIEW OF RELATED LITERATURE
CHAPTER-II

REVIEW OF RELATED LITERATURE

2.1. INTRODUCTION

Review of related literature is an important part of any research work. It helps the investigator gain better perspective of the problem. All available literature concerning the problem at hand were surveyed and examined by the investigator. This investigation will help the investigator for furtherance of knowledge related to the problem.

According to Best (1997), practically, all human knowledge can be found in books and libraries. According to Good (1981), the key to the vast store house of published literature may open doors to the problem, background for the selection of procedure, and comprehensive data for interpretation of result.

In India, as in several countries, learning science is not as popular as it should be. Too few students choose to continue with science into higher education and to a career. Science in schools is often criticized for being too prescribed, impersonal, lacking in opportunity for personal judgments and creativity. Science has reduced to a series of small, apparently trivial activities and piece of knowledge unrelated to the world in which students are growing up. There is a growing acceptance among science education reformers that the process of doing science should not be separated from scientific content and that the aims of science education, should be clearly spelt out. (VIth survey, Page.No:78, 2nd paragraph).

In order to be truly creative and original, one must read extensively and critically as stimulus to thinking. In research, where a new attempt is made, it is important to consult the earlier attempts made in the field. In the present attempt, the investigator has collected 67 studies from Indian and foreign studies abstracts.
2.2 SOURCES OF RELATED LITERATURE

The investigator identified several sources of related literature. They included

❖ Articles in newspaper
❖ Surveys of research in education
❖ Dissertation Abstracts
❖ Journals, e-journals
❖ ERIC - Website

A brief account of the studies is given in the following pages.

2.3 STUDIES RELATED TO ATTITUDE TOWARDS SCIENCE

The investigator was able to find 30 studies in all related to the present study. They were classified as Studies related to attitude towards science in Indian and Foreign studies.

**INDIAN STUDIES:**

**Muhammad Shabbir Ali and Ahmed Sher Awan (2014)** conducted a study on Attitude towards science and its relationship with students’ achievement in science. This study was conducted to examine the relationship of attitude of secondary school students towards science with the achievement in the subjects of Physics, Chemistry, Biology and Mathematics. TOSRA was used to measure students’ attitude towards science and data was collected from 1,885 students of 10th grade. Simple correlation (r), Multiple regression analyses (R) and standardized regression coefficients were used to investigate the relationships between attitude towards science and achievement in science. The results of the study indicated that attitude towards science had significantly positive relationship with the achievement of science students at secondary level. The total number of students selected for the sample was 1,885 (998 male students and 887 female students). These students were
selected from four districts (Okara, Faisalabad, Sargodha and Pakpattan) of Punjab province and they were studying science subjects at secondary level. The students’ achievement in science was a dependent variable of the present study. The students of 10th grade public secondary schools had already appeared in 9th grade Board examinations. The 9th class Board results of these students in the subjects of Physics, Chemistry, Biology and Mathematics were used as achievement measures. The methods used for the analyses were the following: 1) Simple correlation analysis was used to describe the bivariate relationships between each individual achievement scale and each individual attitude scale. 2) Multiple regression analyses were used to investigate the multivariate relationships between each achievement scale with the set of four attitude scales as a whole. 3) The standardized regression coefficients (regression weights) were also examined to interpret the significant multiple correlation. It is concluded from the above discussion that Attitude to Scientific Inquiry and Classroom Enjoyment and Leisure Interest in Science are strong independent predictors of Physics achievement scores. Attitude to Scientific Inquiry and Classroom Enjoyment and Leisure Interest in Science are strong independent predictors of Chemistry achievement scores. It is concluded from the above discussion that Classroom Enjoyment and Leisure Interest in Science is strong independent predictor of Biology achievement scores. Attitude to Scientific Inquiry and Classroom Enjoyment and Leisure Interest in Science are strong independent predictors of Mathematics achievement scores. The conclusions drawn from the above discussion that Attitude to Scientific Inquiry and Classroom Enjoyment and Leisure Interest in Science were strong independent predictors of Total achievement scores. One scale of TOSRA: Classroom Enjoyment and Leisure Interest in Science were positively significant with Biology achievement scores. The positive attitude of students for these two scales caused higher Biology achievement scores. Two scales of TOSRA: Attitude to scientific Inquiry and Classroom Enjoyment and Leisure Interest in Science were positively significant with Mathematics achievement scores. The positive attitude of students for these two scales caused higher Mathematics achievement scores. Two scales of TOSRA: Attitude to scientific Inquiry and
Classroom Enjoyment and Leisure Interest in Science were positively significant with Total achievement scores. The positive attitude of students for these two scales caused higher Total achievement scores.

Norah Frederickson (2014) made a study on twenty science attitude. This study was conducted to analyse the twenty science attitude among the teacher in high school at Calcutta city. In Calcutta city, the data were collected from 875 teachers. Multiple regression analysis and ANOVA were used for the analysis of data to find out the presence of science attitude among them. The result shows that the following twenty science attitude develops the responsibilities of an teacher: Empiricism, Determinism, A belief that problems have solutions, Parsimony, Scientific manipulation, Skepticism, Precision, Respect for paradigms, A respect for power of theoretical structure, Willingness to change opinion, Loyalty to reality, Aversion to superstition and an automatic preference for scientific explanation, A thirst for knowledge, an "intellectual drive.", Suspended judgment Awareness of assumptions, Ability to separate fundamental concepts from the irrelevant or unimportant, Respect for quantification and appreciation of mathematics as a language of science, An appreciation of probability and statistics, An understanding that all knowledge has tolerance limits and Empathy for the human condition.

Vasilia Christidou (2011) has conducted a study on Interest, attitude and images related to science: Combining students’ voices with the voices of school Science, teachers, and popular science. During the last decades students science-related interests, attitude, and images of science and scientists, and their differentiations according to gender, culture, and socio-economic status have been investigated by a multitude of research studies. These aspects of students voices seem to be interrelated and to also affect students achievement in science and their relevant study and career aspirations. Moreover, school science and teachers, as well as popular science are considered as factors determining students voices. This paper attempts a mapping of relevant literature in order to highlight crucial outcomes and draw educational and research implications. It is suggested that a comprehensive and
integrated investigation of the voices of students, of school science teachers, and of popular science is required in order to make informed, research-based decisions on designing school science curricula and teaching.

**Koballa and Glyn (2007)** made a study in which it is suggested that often attitude are used interchangeably with terms such as interest, beliefs, curiosity, opinions, and other commonly used affective-related variables. Clearly, the concept of attitude towards science (often referred to as constructs) is a conglomerate of several components.

**Jayasree, K’s** (1998) made an attempt at correlating scientific attitude and attitude towards science. Another doctoral work by Patil G.S (1997) was a study of scientific attitude of secondary school students from a rural area. The construction of a standardised scale for the measurement of scientific attitude was a part of the thesis. Scientific attitude was related to students performance by Palouse, P.J (1995). The influence of scientific attitude of university entrants on their process outcomes in physics. The attitude of teachers were the focus of study by Naik, A.K.Pathy, M.K(1997) “A study of the attitude of secondary school science teachers towards teaching of science”.

**Weinburgh,(1995)** meta-analyzed different studies to find the differences in students’ attitude towards science on the basis of gender as well as correlation of attitude towards science with achievement in science. 18 different studies were examined and the number of students in these studies were 6,753. The results of this meta-analysis expressed that the mean correlation between attitude towards science and achievement in science was .55 for girls and .50 for boys. In the subjects of biology and physics, the correlations were positive for both boys and girls, but stronger in girls than boys. The results of the analysis also explained that positive attitude of all the students caused higher achievement in the subject of science.

**Prakash** (1994) conducted a study to find out the impact of different educational practices on fostering positive attitude toward science among the
students in the age group 17-19 years of science stream at the higher secondary stage. The result revealed that the traditional group is superior than C.B.S.E and I.C.S.E students in attitude towards science.

Narchi (1990) employed a causal model to investigate the effects of parental background, student background, personality traits and gender on attitude towards science. The findings showed that students' background influenced their attitude towards science. It was also revealed that student's past experiences and attitude towards science play an important role in their commitment to the choice of Science and Non-science College major.

Chambers (1983) conducted a study on attitude to be a continuing field of interest (11%) for students in science education. The development of better attitude science is often recognized as an important aspect of science education and research into student’s images of science has been around for quite some time. He stated that in the 18th and 19th centuries there were varied visual and verbal images of scientist, which are rarely seen now. Though these images were stereotypic, their range was large, varying from scientist as diabolical madmen to harmless eccentrics. However, as science transformed its organisational structure, improves its general social status, and established its social authority, a new professional image emerged in the media, which is a ‘cleaned up’ and standardized one.

Willson (1983) meta-analyzed 43 different studies to find out the correlations between attitude towards science and achievement in science. The population of these studies were the students of kindergarten through undergraduate college level. Multiple regression analysis and ANOVA were used for the analysis of data to find out the correlations between attitude towards science and science achievement. From the meta-analysis of these 43 studies, it was concluded that attitude towards science and achievement in science had large positive correlations as a whole. It was also indicated that correlations were low at elementary level but from grades 7 to 11, the
correlations between attitude towards science and science achievement were highly positive.

**Hough and Piper (1982)** conducted a research to investigate the relationship between attitude towards science and science achievement. They collected data from 583 intermediate elementary students. These students were pre- and post-tested. After the analysis of data it was indicated that there was a significant positive relationship between students’ attitude towards science and science achievement ($r = 0.45$). The students with positive attitude towards science had higher achievements. On the other hand, the students with negative attitude had lower achievement in science.

**The TOSRA by Fraser (1981)** was used for measuring attitude towards science. The achievement in science was measured by using letter grades about the subject of science given to the students. It was indicated that there was a strong relationship between attitude towards science and achievement in science. The students’ attitude towards science was more positive and their achievements were higher.
FOREIGN STUDIES:

Saeed Daneshamooz, Hassan Alamolhodaei, Saeed Darvishian and Soniya Daneshamooz (2013) took up a study entitled “Science center and attitude”. The project team gathered data with the assistance of Recreational and Cultural Organization of Mashhad Municipality, Organization of Mashhad Municipality and Science and Astronomy Science Center of Mashhad Municipality, Khorasan Razavi, Islamic Republic of Iran. This paper discusses the effect of science center on attitude of students who visit it. Previous research identified key variables that are fundamental to free-choice science learning. The sample consists of 1002 students of grades 9, 10 and 11 studying in high schools. Before and after the students visited the science center, they filled a questionnaire about their attitude toward science. Results showed that visiting the science center improved the students' attitude towards science. Based on the criterion of attitude growth and gender difference, male’s attitude improved more than female’s. Moreover, there were significant differences between students in grade 11, 10 and 9. In addition, Univariate analysis of variance (ANOVA) indicated that the grade and gender difference had significant effect on criterion of attitude growth.

Hasan Said Tortop (2012) studied on Development of teachers’ attitude scale towards science fair. This study was conducted to develop a new scale for measuring teachers’ attitude towards science fair. Teacher Attitude Scale towards Science Fair (TASSF) is an inventory made up of 19 items and five dimensions. The study included such stages as literature review, the preparation of the item pool and the reliability and validity analysis. First of all, the draft scale including 48 items was prepared depending on science fair studies and interviews of teachers reported in related literature. The draft version of the scale was applied to 275 teachers from the cities of Zonguldak and Isparta in Turkey. The results of the exploratory factor analysis revealed that the teachers’ attitude scale towards science fair made up of five factors including such dimensions as contribution to students’ development, educational importance, judgment, negative behaviour and mentorship.
Muhammad Anwer and Hafiz Muhammad Iqbal (2012) found out the Students’ Attitude towards Science: A Case of Pakistan. This study was conducted to examine students attitude towards science. The sample of the study consisted of 3526 students of 10th grade (Boys = 1914, Girls = 1612) and were from urban \( (n = 2304) \) and rural \( (n = 1222) \) localities of Pakistan. The instrument administered was ‘Test of Science Related Attitude’ (TOSRA) developed by Fraser (1981). Results of the study depicted a significant effect of gender and locale on students attitude towards science. Girls had significantly higher attitude towards science than boys on total scale and on all sub-scales of TOSRA with only one exception of Career Interest in Science subscale on which boys were slightly higher than girls but it was not significant. Locality wise results showed rural students to score significantly higher on the total scale and on the subscales of Social Implication and Career Interest in Science than the urban respondents, while the urban respondents scored significantly higher on the subscale of Adoption of Scientific Attitude than the rural respondents. There was no significant variation between the rural and urban respondents in their Attitude towards Scientific Inquiry, Enjoyment of Science Lessons and Leisure Interest in Science. This study has wide implications for educationists.

Avi Hofstein & Rachel Mamlok-Naaman (2011) studied on High-School Students’ Attitude towards Interest in Learning Chemistry. Developing positive attitude toward an interest in science in general and learning science in particular is one of the key goals for teaching and learning the sciences. Thus, over the years, this area fuelled many research studies, these being focused on: content, pedagogical, and curricular issues. In this paper we focused on the issue of enhancing attitude and interests in the context of chemistry learning mainly at the upper secondary level of schooling. The authors of this manuscript suggest that the three key factors that should be considered for enhancing attitude and interests are the methods used to present the content (e.g. relevance, and historical approach), instructional techniques that are implanted, and gender issues. Although throughout the years, we have learned a lot regarding teaching and learning of chemistry we are unable to provide
conclusive recommendations regarding how in the context of chemistry education affective constrains could be enhanced. However, based on scholarly developments and research we suggest areas (see above) that should be considered by science (chemistry) educators, curriculum developers, and chemistry teachers who believe that developing positive attitude is one of the central goals.

**Dr. Samir Najdi (2010)** studied on “Students Attitude towards Learning Chemistry”. Students’ attitude to learn chemistry is a complex construct. Developing positive attitude towards learning chemistry in particular, is one of the key goals for teaching and learning sciences. In this work, we made an attempt to identify factors that could positively influence the attitude towards learning chemistry of a sample of 103 students (boys and girls) of 10th grade, from five randomly selected private secondary schools in Jerusalem. Based on existing theoretical frameworks, the assessment tool was developed and tested for validity and reliability. Necessary data were collected and analyzed by calculating the means, standard deviations and simple percentages. The results showed negative attitude of students towards the subject were due to inadequate teachers’ approach to the material, and poor non-formal instructional materials. Moreover, the study showed no attitude differences related to gender. Some useful recommendations were profound in designing new curricula to guide and improve students’ attitude towards the study of chemistry.

**Bennett and Hogarth (2008)** suggested that positive attitude towards science have shown decline most sharply between the ages of 12 and 14 – the so-called “Year 9 dip”. At these ages, Potter and Parvin (2008) have noted that children in the UK see science as becoming too theoretical and irrelevant to everyday experiences, moving away from the practical work that they most enjoyed. While three-quarters of 9-14 year olds still saw science as useful, they were not inspired by it.

**Dr Sue Collins, Professor Michael Reiss and Dr Shirley Simon (2006)** conducted a study on “A literature review of research conducted on young people’s attitude to science education and biomedical science”. A literature review of research conducted to date about young people’s attitude toward science education and biomedical science was conducted by a team from the Institute of Education.
While there has been a large volume of research undertaken in the area of science education over the past four decades largely due to concern about the numbers of young people turning away from science. 1. The review underlines a lack of research into young people’s attitude to biomedical science. 2. Classroom environment and perceived quality of teaching in the sciences are found to be influential in determining attitude toward science education among young people. Perceptions of quality of science teaching decline as pupils move from primary school into secondary school. The report recommends that research is needed to identify the nature of quality teaching in science as perceived by young people aged 14 years and over. It is envisaged that the outcome would support teachers in the development of practice and provide insight into possible reasons for a decline in perceptions of quality teaching in science as pupils move through secondary school. 3. There is lack of agreement among researchers about the strength of parental and peer influence on young people’s attitude toward science. This may be the result of ill defined or inconsistent measures of influence, chiefly related to peer groups. 4. Evidence concerning the influence of culture and ethnicity on attitude towards science is inconclusive though there is a history of lowered involvement in science among some ethnic groups, the reasons for which remain unclear. An in-depth exploration of cultural and ethnic influences on attitude toward science is needed to inform science education policy. 5. Boys continue to express consistently more positive attitude toward many aspects of science than do girls. However, girls express consistently more positive attitude toward biology, particularly human biology, and areas of science that reward imagination and aesthetic appreciation. Girls tend to do slightly better than boys at GCSE level in biology and chemistry, though boys achieve higher scores in physics. In considering the influence of gender on attitude, further research should investigate why girls have significantly more positive attitude towards biology as this will help to inform subsequent steps to improving gender bias towards particular strands of science. 6. Evidence of a correlation between achievement and attitude toward science is inconclusive. However, evidence of a correlation between achievement motivation and attitude
emerged from one study. Work is needed to ascertain the extent to which a correlation exists in young people between motivation to learn science and attitude towards science. 7. Although projects such as the International Longitudinal Relevance of Science Education (ROSE) project does not examine young people’s opinion on issues related to biomedicine but to school science in general, they have important implications for the proposed Welcome Monitor. Particularly in the development of quantitative research instruments for the measurement of attitude that facilitate comparison between groups of young people of similar age. The dearth of studies that explore attitude of young people toward biomedical science suggests there is considerable scope for research in this area. Consideration needs to be given to the extent to which descriptive statements will be required to ensure that the young people interviewed have the required level of scientific knowledge and understanding sufficient to enable them to offer informed views. Appropriate research methodology to support the aims and objectives of the proposed Welcome Monitor should take account of the need to understand, not only the nature of young people’s attitude toward science and the biomedical science but also why they hold these attitude. Such insight would help to inform future developments in science curricula. The review concludes that the Welcome Monitor’s proposed rolling programme of research, utilizing complementary research methods of triennial surveys and possible exploratory qualitative research has the potential to provide rich opportunities for in-depth exploration of factors influencing the attitude of young people toward biomedical science. Although the emphasis of the proposed Welcome Monitor is on biomedical science, the findings and outcomes of such research are likely to have broader implications for the science curriculum and teaching strategies in the short and longer term.

**Jarvis, Tina; Pell, Anthony** (2005) studied on Factors Influencing Elementary School Children's Attitude toward Science before after a Visit to the UK National Space Centre This article reports on attitude changes of 300 children, aged 10 or 11 years, from four schools, who visited the UK National Space Centre.
Attitude toward science and space were explored by examining responses to five different attitude scales. These were administered before, immediately after, and 2 months and 4-5 months after a visit to the main exhibition area and Challenger Centre. Observations during the visits and interviews of teachers and a sample of children were carried out. Before the visit girls were more anxious than boys. Immediately afterward, children showed more interest in space and a moderate increase in their views about the value of science in society. Nearly 20% of the pupils showed an increased desire to become scientists in the future. These children also showed a positive advantage over the other children with regard to science enthusiasm and space interest. Two months later, they continued to be more positive about being future scientists but only the girls' scores were still significantly raised. Most children found the Challenger experience positive but had more problems with the exhibition area. Teachers' preparation and support during the visit as well as their personal interest had a significant long-term effect on children's attitude.

Jonathan Osborne, Shirley Simon and Sue Collins (2003) worked on Attitude towards Science: A Review of the Literature and its Implications. This article offers a review of the major literature about attitude to science and its implications over the past 20 years. It argues that the continuing decline in numbers choosing to study science at the point of choice requires a research focus on student attitude to science if the nature of the problem is to be understood and remediated. Starting from a consideration of what is meant by attitude to science; it considers the problems inherent to their measurement and what is known about students attitude towards science and the many factors of influence such as gender, teachers, and curricula, cultural and other variables. The literature itself points to the crucial importance of gender and the quality of teaching. Given the importance of the latter, we argue that there is a greater need for research to identify those aspects of science teaching that make school science engaging for pupils. In particular, a growing body of research on motivation offers important pointers to the kind of classroom
environment and activities that might raise pupils interest in studying school science and a focus for future research.

**Ferreira** (2003) examined gender issues with respect to attitude towards science and achievement in science. The results of the study declared that attitude of the students towards science were reflected in their achievement in science. There was a positive significant relationship between attitude towards science and achievement in science. Positive attitude of the students towards science caused the higher achievement in science.

**Mattern and Schau** (2002) conducted a study for the determination of gender differences in relationships of attitude toward science with achievement. 1,238 students of 7th and 8th grades were selected as sample. This sample was selected from eight different schools in Northern New Mexico. Three instruments (one for attitude towards science and two for achievement in science) were used for the collection of data. It was indicated that there was no significant effect of achievement in science on attitude among girls. While among boys, the results were different.

The main purpose of the study of **Chen** (1995) was to identify the important factors in predicting science achievement and attitude outcomes of 6th grade students in Taiwan. The study found that 1) prior achievement and peer environment showed statistically significant direct effect on science achievement, 2) home environment was the only productivity factor which showed statistically significant indirect effect was transmitted through prior achievement, 3) quantity of instruction, quality of instruction and media effects were primary factors, which had statistically significant direct effects on attitude towards science. Moreover, motivation, class environment, and peer environment exhibited statistically significant indirect effects on attitude towards science.
Freedman, (1997) investigated the relationship of attitude towards science with achievement in science. The data was collected from 20 physical science classes. The analysis of data expressed that there was a significantly positive correlation of students’ attitude towards science with their achievements. It was concluded that achievement in science was affected by attitude towards science.

The study of Tamir (1991) attempted to find out the relationship and possible effects of various personal, home, and school variables on the acquisition of functional scientific knowledge by 10th grade students in Israel. It was found that for functional knowledge in biology, the most influential variable was intention for further study, followed by attitude toward science, reading outside school on science topics, career aspirations, achievement in school science, and school environment.

Similarly, Simpson and Oliver (1990) conducted another longitudinal study on more than 4000 students in grades 6-10. These students were selected from 178 science classes. The results of this longitudinal study showed that male students had significantly more positive attitude towards science and their achievement in science was higher than female students. The results also made it clear that students’ attitude towards science as a whole became less positive from grades 6 through 10.

Nelliappan (1987) as noted earlier, studied attitude and interest within the learning environment and found that various components of learning environment are significantly related to interest. Using a sample of 342, eighth grade students at two urban middle class schools in Australia.

Punch and Rennie (1989) studied relationship between affect and achievement in high school science. Multiple linear regression was used to examine the direction of the relationship between science-related affect and achievement. It was found that affect is related more strongly to previous than to subsequent achievement, and that students perceptions of their past performance in science form the most important component variable of science-related affect associated with both previous and subsequent achievement.
Oliver and Simpson (1984) conducted a longitudinal study in central North California to explore the influence of attitude on achievement in science. Initially data was collected from a group of 5000 students in grades 6-10 in 1980-1981. The results of the study indicated that there was a strong positive relationship between attitude towards science and achievement in science at different grades.

2.4 STUDIES RELATED TO SCIENCE EXHIBITION

The following 32 studies were focused on the Science Exhibition. These studies helped the investigator to tone up the present view.

INDIAN STUDIES:

Marshall, Jeff (2006) studied on Building Knowledge & Intrigue: Creating an Interactive Science Museum. The energy and enthusiasm shown by young students walking through the doors of an interactive science museum is difficult to surpass. Awaiting them is an opportunity to explore, create, discover, and learn about the world. This article presents the interactive science museum project of eight-grade students. Fifth-grade students were the target audience for the culminating museum exhibition. A primary goal of the project was to maximize the active engagement of the learner during his or her experience. The project was conducted late in the school year. It provided students an opportunity to review and synthesize information; collaborate with peers; become specialists in a topic; and engage, encourage, and excite younger students about science. Eighth-grade students developed a list of potential topics from various themes studied throughout the year. Key themes were generated based on the scope and sequence of their science program in accordance with state and National Science Education Standards for the eighth-grade level.
Sleeper, Melissa; Sterling, Donna (2004) undertook the study of The In-Class Science Exhibition Teaching Methods. Science Instruction One of the easiest ways to capture student’s sense of wonder is to provide them an opportunity to participate in scientific research and display their findings in a science exhibition. Giving students the freedom to follow their own interests and develop their own science exhibition projects ensures active involvement in the learning process as they investigate subject matter, formulate their own questions, look at ways to answer the questions, and proceed with research, experimentation, and observation. The in-class science exhibition is a natural extension of the regular science program, especially when used as a teaching tool rather than as a contest. Participation in the exhibition is mandatory since all experiments are conducted in class. Through their experiments, they will develop science process skills by identifying and interpreting relationships between experimental variables and controls and see how "real" scientists work. This article discusses details relating to planning the exhibition; selecting a research topic; conducting investigations; and reporting results.

Khatoon.T. (1998) studied on A comparative study of students attitude towards science and achievement. It focuses on the changes or differences in their attitude towards science. Other studies focus on the changes or differences in education. Bagchi, J.P (1993-1994) studied the impact of different educational practices on students attitude focused on a specific aspects of science that is exploring students’ attitude towards laboratories and other related practical work in science.

Falk, John H(1997) undertook the study of Testing a Museum Exhibition Design Assumption: Effect of Explicit Labelling of Exhibit Clusters on Visitor Concept Development.; Scientific Concepts Investigates a museum exhibition design assumption that visitors develop conceptual understanding of a science topic after utilizing a cluster of conceptually related exhibits which lack explicit concept labelling also investigated whether visitor concept development could be enhanced through the addition of explicit labelling of the intended conceptual message.
Thomas, Peter (1997) undertook the study of Energy Day Through Science Fairs. It describes a program in which students present their displays in the normal science-fair style but without the competitive element and more as a "science-share". Describes an "energy day" celebration which included an energy exhibition and engaged students in an "energy decathlon" that challenged them with tasks encompassing many aspects of energy.

Ucko David A.; And Others (1986) studied on An Exhibition on Everyday Chemistry: Three Dimensional Aids. It discusses a recent addition to the Museum of Science and Industry (Chicago) known as "Everyday Chemistry." This permanent exhibit on modern chemistry incorporates demonstrations of chemical reactions in ways intended to enhance public understanding.

FOREIGN STUDIES:

Chien, Annie; Karlich, Lisa (2007) studied on Frameworks for Making Science Research Accessible for All Scientific Research. Science teachers embrace environments that foster inquiry, discovery and critical thinking. Students do authentic independent research projects that put them in the role of scientists. At School of the Future (SOF), students must do four research projects, also known as exhibitions, as a part of their graduation requirements. Students are expected to do one of the required four exhibitions each year. Each student is assigned to a sponsor, a SOF teacher who acts as the high school equivalent of a research advisor, providing support throughout the process. Much like a college thesis, the students are expected to produce a paper documenting their research as well as present their work in front of a committee of teachers, peers and community members. The student's work is evaluated based on an established rubric. Because science embraces hands-on experiences, students are usually fascinated and motivated by the subject. Despite the instant engagement and buy-in that science research offers, students aren't always ready for it. Science research requires a set of specific skills and aptitudes. Science exhibitions demand that students have research skills: they
should be able to know how to find resources, take notes, read critically, and analyze information. In addition, they need to know how to read and write scientific language. Ultimately, science exhibitions demonstrate that students have the ability to design experiments, carry them out, and analyze the results. Students should be able to pose a testable question, form a workable hypothesis, design an experiment, and be able to collect data. After all this, students have to make sense of their data and critically examine its validity in order to improve the experiment. Being able to accomplish this is a difficult feat. How can science teachers create a supportive and challenging exhibition experience without overwhelming their students? In this article, the authors give some frameworks to refine one's research exhibition program to make it accessible for all.

Cohen, David (2007) has conducted a study on Creatures in an Exhibition Recreational Facilities in Adelaide Zoo, already home to 3,400 animals representing nearly 300 species of exotic and native mammals, birds, reptiles, and fish, just acquired a new specimen: Homo exhibitionist. For 28 days, four sets of six volunteers get to spend a week living the life of an animal, foraging and playing and partying like it's 1999 million years ago. The idea is to raise popular awareness of conservation matters, in particular the preservation of apes in the wild, whose plight is described on signs around the 50-by-65-foot enclosure, and to finance a new enclosure for apes at a sister zoo, all the while conducting behavioral research study about how creatures cope living paw by jowl in such a close setting.

Davidsson, Eva; Jakobsson, Anders (2007) studied on Centres Science; . Science centres aim to present science in ways that will attract visitors and enhance public interest in, and knowledge of, science. But what images and different aspects of science are visitors confronted with at Nordic science centres? This study aims to explore the different aspects of science that are displayed and the ways in which these aspects constitute different images of science. In this study, staff members who work with the planning and creation of new exhibitions were asked to answer a web-based questionnaire, identifying the extent to which different aspects of science were
displayed in their latest exhibition. They were also asked to voice their opinions on what, and to what extent, they would like to display different aspects in future exhibitions. This study shows that exhibitions today, in particular, choose to display the wonders of science, presenting science in a product-oriented and unproblematic way. The study also reveals a great discrepancy between what staff members display at their latest exhibitions and what they want to display in future exhibitions. They express a will to emphasise aspects of science on the basis of a societal and cultural perspective. This means that controversial issues, values in society, non-western science, and scientific processes constitute important components for future exhibitions.

Falk, John; Storksdieck, Martin (2005) undertook the study of Using the Contextual Model of Learning to Understand Visitor Learning from a Science Centre Exhibition. Adults Falk and Dierking's Contextual Model of Learning was used as a theoretical construct for investigating learning within a free-choice setting. A review of previous research identified key variables fundamental to free-choice science learning. The study sought to answer two questions: (1) How do specific independent variables individually contribute to learning outcomes when not studied in isolation? and (2) Does the Contextual Model of Learning provide a useful framework for understanding learning from museums? A repeated measure design including interviews and observational and behavioral measures was used with a random sample of 217 adult visitors to a life science exhibition at a major science centre. The data supported the contention that variables such as prior knowledge, interest, motivation, choice and control, within and between group social interaction, orientation, advance organizers, architecture, and exhibition design affect visitor learning. All of these factors were shown to individually influence learning outcomes, but no single factor was capable of adequately explaining visitor learning outcomes across all visitors. The framework provided by the Contextual Model of Learning proved useful for understanding how complex combinations of factors
influenced visitor learning. These effects were clearer when visitors were segmented by entry conditions such as prior knowledge and interest.

Falcao, Douglas; Colinvaux, Dominique; Krapas, Sonia; Querioz, Gloria; Alves, Fatima; Cazelli, Sibele; Valente, Maria Esther, Gouvea, Guaracira (2004) studied on A Model-Based Approach to Science Exhibition Evaluation: A Case Study in a Brazilian Astronomy Museum Teaching Methods; models and modelling approach was adopted to investigate the educational potential of a science museum exhibition. It focused on patterns of relationship between the teaching models proposed by designers and students models in regard to four exhibits concerning astronomical cycles. Student's models were elicited by interviewing 21 pupils selected from among those who showed a change of their models between pre-visit and post-visit questionnaires. Four patterns of relationship were identified, ranging from low to high degrees of convergence between designers and students. Exhibits designed by fragmenting the phenomena (analytical approach) tend to promote less convergent patterns than exhibits that maintain the complexity of the phenomena (synthetic approach). We argue that the two approaches are complementary: without synthetic models visitors find it difficult to identify the phenomenon addressed by analytical models, while the latter may bring to visitors' attention aspects that otherwise might be hidden by the complexity of synthetic models.

Tunnicliffe, Sue Dale; Laterveer-de Beer, Manon (2002) undertook the study of An Interactive Exhibition about Animal Skeletons: Did the Visitors Learn Any Zoology? Explores museum visitors' understanding of skeleton exhibits and whether such exhibits increase their understanding of the zoology displayed. The exhibition under study focused on the diversity of vertebrae skeletons which were arranged according to the mode of locomotion.

Henriksen, Ellen K.; Jorde, Doris (2001) undertook the study of High School Students' Understanding of Radiation and the Environment: Can Museums
Play a Role? Student Attitude teaching units were developed by the Norwegian Museum of Science and Technology for visiting students. Using these units as an evaluation instrument, students' written responses were analyzed to gain insight into student understanding and attitude toward radiation issues and to explore whether the exhibition may successfully convey scientific information.

Tunnicliffe, Sue Dale (2000) studied on Conversations of Family and Primary School Groups at Robotic Dinosaur Exhibits in a Museum: What Do They Talk About? In Science Education, the Sex Differences Exhibits are a way of self-guided presentation in which visitors use their own knowledge and understanding. Studies as self-guided group visiting an exhibition on dinosaurs which are displayed as robotic models finds that the animatronics have a well thought out storyline that increases family and school visitors' understanding of the exhibit topic.

Barnett, Demian (2000) studied on Learning How To Learn. Accountability; In one California high school, learning to learn is a measurable outcome assessed by all students' participation in graduation by exhibition. Students must meet state requirements and demonstrate learning process by publicly exhibiting their skills in math, science, language arts, social science, service learning, and post graduation planning.

Van den Berg, Ed; Baricuatro, Jack; van den Berg, Rosea; Gallos, Malou; Japitana, Jean; Locaylocay, Jocelyn (1999) studied on the Science Exhibitions as Training for Future Science Teachers. Science Instruction gives a rationale for, and benefits of, having science teachers conduct a science exhibition for high school students and teachers provides organizational hints and recommendations.

The total scientific process should be involved in the development of a project which results in a science fair exhibition. The student should learn to recognize problems, plan an experiment, gather and analyze data, and draw conclusions. In doing this, students gain self-confidence and the respect of their peers and often spark a lifelong interest in science. Fairs also help to strengthen the links between the school and the local community. This pamphlet discusses the science fair movement in North Carolina, including state rules, regulations and judging criteria, and how to plan, conduct and present a science project for a science fair. Also included is the North Carolina code of practice for using animals in schools, and eight references.

**Brand, Judith, Ed.** (1998) undertook a study on themes of the exhibition held at San Francisco's Exploratorium that ran from May 22, 1998 through January 1999 and that contained over 40 hands-on exhibits, demonstrations, artworks, images, sounds, smells, and tastes that demonstrated and depicted the biological, psychological, and cultural dimensions of human memory. Contents include: (1) "A Multiplicity of Memory" (Jonathan School); (2) "Messing with Your Mind" (Pat Murphy and Paul Doherty); (3) "The Anatomy of Memory" (Sitara Cave and Susan Schwartzzenberg); (4) "Young in Mind" (Mary K. Miller); (5) "Battling Icons" (Amy Snyder); (6) "Erased Memories" (Paul Kwan and Arnold Iger); (7) "Earliest Memories" (Susan Schwartzzenberg); and (8) "Portraits for the Twenty-first Century".

**Jennings, Gretchen; Craig, Michelle L.** (1997) studied on Exhibition based skills: Skills. Describes an exhibition-based activity set that teaches important psychological processes such as attention (Interference), communication (Pattern Talk), and cooperation versus competition (Do Nice Guys Finish Last?). Activities follow the scientific method, and teachers can observe varying levels of skill and cognitive development in students of the same chronological age to create assignments that address varying learning styles and abilities.

**Borun, Minda** (1996) studied on Measuring the Immeasurable: A Pilot Study of Museum Effectiveness. The report describes a one-year pilot study of museum effectiveness conducted at the Franklin Institute Science Museum and Planetarium in Philadelphia. The study was intended to develop models for testing visitor response, provide useable information to museum staff, and test the feasibility of a large-scale investigation of science museums. Numerous tests and questionnaires were administered to visitors in an attempt to assess motivation for the visit, visitors' interests, exhibit preferences, orientation, attitude change, and information transfer. Results showed that the Franklin Institute audience consists primarily of groups, especially families and school classes. The average visitor leaves the museum knowing over half of the tested information content of the exhibits. Attitude toward the museum appeared to be negatively affected by building construction at the time of the study. Most of the visitors showed a favourable attitude toward science, scientists, and technology. A project to orient visitors to the museum's structure and contents produced more favourable attitude and higher knowledge scores. Effectiveness of exhibition in terms of complexity, background colours, and participatory devices was also measured. The report concludes with a discussion of implications of the study and a bibliography of over 40 resources.

**Cole, Peggy Ruth; Cutting, Jennifer McGregor** (1996) studied on the Inside Story of Science City: An Outdoor Public Science Exhibition Curriculum. This study discusses and compares on-site and off-site exhibition development. Argues that the development and installation of museum exhibits for
public urban spaces requires skill and experience that stretches beyond the expertise of a science-technology museum exhibition staff. Focuses on Science City, an outdoor exhibition created by the New York Hall of Science.

**McCartt, Drew** (1996) studied on Toward Inclusive Classrooms. Two chapters of the book, "Toward Inclusive Classrooms," are abstracted here. The chapters concern team teaching a seventh-grade science class and developing a sixth-grade science exhibition. They show how teachers cooperated to plan for inclusion of students with disabilities, how difficulties were handled, evaluation procedures, and recommendations.

**Branca, Barbara** (1995) undertook the study of Ocean Planet. Interdisciplinary Marine Science Activities. The Ocean Planet is a traveling exhibition from the Smithsonian Institution designed to share with the public what recent research has revealed about the oceans and to encourage ocean conservation. This booklet of lessons and activities adapts several themes from the exhibition for use in middle and high school classrooms. Lesson plans include: (1) "Sea Secrets" that explores ocean geography; (2) "Sea Connections" that looks at plants and animals that live in different marine ecosystems; (3) "Pollution Solution" that examines the effects of an environmental crisis; (4) "Stranded Along the Coast" that explores both natural and human causes of animal stranding; and (5) "Reflections on the Sea" that explores the influence of oceans on language and literature. Each lesson plan contains background information, a statement of learning objectives, a list of required materials, step-by-step procedures, student handouts, and a list of educational resources including connections to the online version of the Ocean Planet exhibition.

**Cutting, Jennifer McGregor;** (1995) studied on Take to the Streets: Guide to Planning Outdoor, Public Exhibits. Placing exhibits in public places provides a unique opportunity to reach a broad non-museum-going audience. It offers marketing and publicity opportunities as well as the potential to develop
relationships with agencies and individuals who are stakeholders in the public site. The purpose of this guidebook is to describe the steps in creating an outdoor public exhibition. It contains general principles for planning, designing, and implementation to supplement the usual exhibit development process. It is arranged in sections which follow the chronology of exhibition development. Each section includes practical information, personal experiences, and tools used in developing "Science City," an innovative sidewalk science exhibition designed to reveal the science and technology of the urban infrastructure. Sections include Site Selection, Approvals and Permits, Forming a Team, Design and Prototyping, Fabrication, Installation, Operations and Maintenance, Evaluation, Related Public Programming, Promotion and Marketing, In-Kind Support and Science City Project Costs, and Timeline. The guide ends with a summary and conclusion.

Gray, Derek J. (1993) studied on Schools Science Exhibition. Educational Quality; The article evaluates student science projects encouraged by a South African Science Exposition using the criteria of secondary science educator, J.R. Campbell, and the task descriptors of the educator of the gifted, J.S. Renzulli. It is concluded that the preparation of such projects meets the educational standards cited.

Salmi, Hannu (1993) conducted a study on Science Centre Education. Motivation and Learning in Informal Education Research Report119. This study investigates student learning in science center exhibitions as a form of informal education and examines intrinsic, instrumental, and situational student motivation. Subjects (N=130) consisted of 6 comprehensive school classes of 7th graders in the greater Helsinki area. The design of the study was quasi-experimental with two pre-treatment groups (intrinsic vs. instrumental motivation) and a situational motivation group as the control. Classes were tested by an intrinsic/instrumental motivation test, and by a specific situation motivation test measuring the exhibition experience. A knowledge test measured the effects of a pre-lesson and the learning of isolated facts and entities. Results indicated: (1) the intrinsic treatment group did best in nearly all
cognitive tests; (2) the situation motivation group performed better than expected; (3) instrumental motivation does not apply to informal learning; (4) the theory of intrinsic, instrumental, and situation motivation, at least in informal education, is confirmed; (5) the science center exhibition proved to be a motivating setting for learning; and (6) it would be instructive to apply these findings to formal education. Appendixes provide Finnish and English versions of the testing instruments.

**Fortner, Rosanne W. (1986)** studied on A Multi-Phased Evaluation of the Impact of a Non-School Science Exhibition. The impact of "The Great Lake Erie," an outreach program that aimed to improve visitor knowledge and attitude about Lake Erie, is discussed in this evaluative study. "The Great Lake Erie" was presented as a two-part program consisting of a lecture and demonstration stage presentation and a series of exhibits. The program was open to school groups during weekdays and to the general public on weekends and evenings. Visitor behavior at the exhibits was monitored, and the 17 displays were evaluated on their attention-holding ability, knowledge impact, instructional component, accommodation potential, and self-defectiveness. The highest rated exhibits tended to be self-directive and highly interactive. To assess knowledge and attitude changes related to the program, a pretest-post test questionnaire was completed by visiting adults and students. Students and adults responded differently to the program. Adults showed significant knowledge gain while students did not. On attitude, students and adults were positive on the pre-test, but only students showed a positive shift on the post-test. Positive feedback was obtained from teachers who participated in the program with their classes. A diagram of the display area and exhibit design, as well as observation form, is included.

**Sow, A. Lynn; O'Malley, Kimberly J.; Cody, Marisue Kunik, Mark E. (1985)** undertook a study of the Papers on research in library science and the exhibition of library materials which were presented at the 1982 International Federation of Library Associations (IFLA) conference include: (1) "Terminological Problems of Networks," a discussion by Helena Kolarova Palkova of the meaning of
"library networks" and "methodological work" in Socialist and Western librarianship, with a description of the structure of Socialist library research networks; (2) "Networks in Library Research: The Present State of Communication Between Research Workers" by Patricia Layzel Ward (United Kingdom), which lists existing networks in library research and considers whether research workers are able to communicate within and across national boundaries; (3) "A Working Group on Exhibitions. What For?" an examination by M. T. Varlamoff (France) of the reasons for creating an IFLA working group on exhibitions, and the material, technical, and administrative problems related to exhibitions; and (4) "Loan Items for Exhibitions," a translation from German of a manual of legally-binding regulations covering the lending of items for exhibitions from the Bavarian State Library, including sample loan application and contract forms, and a description of the development and adoption of the regulations.

**Bleecker, Samuel E.** (1979) studied on the Making of a Museum Exhibition. Exhibits. Discusses the preparation of the Reptile and Amphibian exhibition at the American Museum of Natural History. Various steps involved in developing the ten showcases in a six-year period are presented.

**Cardinale, Robert L.; Arch, Adria B.** (1975) made a study of "A Report on a Survey of Artists/Craftsperson’s' Attitude Toward Competitive Exhibitions. Results of a survey to determine the attitude of artists and craftsperson’s toward entering competitive juried exhibitions are reported. Questionnaires were sent to people entering the national Copper, Brass, and Bronze Exhibition for 1977 along with notices of acceptance or rejection. One hundred-ninety artists (38%) responded. The questionnaire contained ten general statements to which respondents agreed, agreed strongly, disagreed, or disagreed strongly. The functions of competitive juried exhibitions were examined in terms of their stimulating high quality work, encouraging unknown artists, establishing recognition, threatening established artists, encouraging work to please jurors, and rewarding a masculine type of competitive spirit. Results indicated that most artists/craft persons perceive
competitive exhibitions as a positive experience. However, frequent responses were that all juried shows are only as good as the jurors; jurying from slides is an inadequate way to conduct an exhibition; and that reasons for acceptance or rejection should be provided to those entering the competition.

Daifuku, Hiroshi (1963) conducted a study on Temporary and Permanent Travelling Exhibitions. The permanent exhibition, the most typical form of museum exhibition, has failed to attract repeated visitation, since visitors quickly become familiar with the objects shown. The temporary exhibition evolved as a result for the need of repeated visitation. The temporary exhibition, set up for a period of one to six months, introduces fresh material to the visitor and stimulates his interest. Moreover, it frequently causes him to revisit the permanent exhibition which contains the museum's main assets. This manual, consisting of seven chapters, deals with the temporary exhibit and travelling exhibit. Part I, the Temporary Exhibit, includes three chapters: The Temporary Exhibit in Science Museums, which deals with designing, staff planning, lighting, sound, etc.; Temporary Exhibits in Art Museums, which considers methods, visitors, catalogues, guides, and talks; and Exhibits in the Technically Underdeveloped Countries, which discusses program types. Part II, Travelling Exhibitions, contains the following four chapters: Chapter IV deals with the origin, sources, costs, supervision, assembly, display, and other topics related to travelling exhibits; Chapter V discusses principles of packing; followed by Chapter VI, transportation. Chapter VII, the final chapter, considers insurance policies. This study concluded that temporary exhibition create more attraction than permanent exhibition in the museum.
2.5 STUDIES RELATED TO SCIENCE EDUCATION

The investigator has located only 5 studies related to science education. Among these 4 studies highlight the effect of science education and 1 study focused on enjoyment in science.

INDIAN STUDY:

Archer et al. (2010) has furthermore highlighted that children can report enjoying science, finding it important and interesting, but still reject the idea of working as a scientist. The authors suggested this was because “doing” science carries a very different meaning to “being” a scientist, with the latter raising stereotypes of the eccentric scientist.

FOREIGN STUDIES:

Peacock, Jeremy S (2014) Science Instructional Leadership With science teachers facing comprehensive curriculum reform that will shape science education for decades to come, high school department chairs represent a critical resource for instructional leadership and teacher support. While the historical literature on the department chair indicates that chairs are in prime positions to provide instructional leadership, it is also clear that chairs' ability to provide such leadership is limited by lack of line authority, time, role conflict, and ambiguity. Yet the literature and practical experience indicates that department chairs can exert a positive and important influence on instruction and learning within high school science classrooms. Drawing on a historical review of the literature on high school department chairs and on recent literature in science education and instructional leadership, this article presents a conceptual model of science instructional leadership for high school department chairs and discusses implications for researchers and practitioners. The model includes four interdependent leadership capabilities for science instructional leaders: (1) science leadership content knowledge, (2) negotiating context and solving problems, (3) building a collegial learning environment, and (4) advocating for science and science education.
Osborne et al. (2003) summarized a range of studies related to the attitude issue and suggested a list of components used and incorporated a range of components in these studies including the following:

- The perception of the science teacher
- Anxiety towards science
- The value of science
- Self-esteem regarding science
- Motivation for science
- Attitude of peers towards science
- Enjoyment of science
- The nature of the classroom learning environment
- Achievement in science and fear of failure in taking a science course
- Preference of learning approaches (pedagogy)-subject preference courses and
- Enrollment in science courses in school.

Heering, Peter; Muller, Falk (2002) studied on Cultures of Experimental Practice--An Approach in a Museum. Secondary Education Describes generations and experiences of an exhibition presented in Spring 1998 at the Oldenburg Museum of Natural History and Pre-History. Discusses the thematic leitmotiv of this exhibition which was to present experiments from the history of physics as a cultural activity. Describes how reconstructions of historical experimental set-ups were shown and enabled visitors to have their own experimental experiences.
Marshall, McClymont and Joyce, (2007) took up a study on MORI/Office of Science and Technology in 2005 and they found that people in the UK aged 15+ tended to take a narrow view of what constitutes “science”. The most common spontaneous mentions among UK adults were laboratories, Bunsen burners, test tubes and chemicals (19%), and advancements in healthcare (17%). By contrast, “engineering” (which BIS includes in its definition) evoked different associations, mostly about construction and machinery. This supports more recent qualitative research which found that people’s understanding of engineers and engineering was primarily related to construction and manual professions, rather than to the sciences.

2.6 CRITICAL REVIEW OF RELATED STUDY

The investigator consulted different sources for the review of the related studies. They were: Survey of Research in education published by NCERT, Encyclopedia of Educational Research, several Indian and foreign journals and their back volumes and so on. These sources were found in various libraries like Madurai Kamaraj University Library in Madurai, Manonmanium Sundaranar University Library in Tirunelveli, British council Library and Tamil Nadu Teachers education University Library in Chennai. The investigator reviewed Indian and foreign journals received in these libraries. The investigator browsed through internet such as ERIC and collected e-journals and research articles. The selected studies were classified and reviewed. They were critically reviewed by the investigator. The investigator critically reviewed the studies and explained as follow as:

Muhammad Iqbal (2012), Avi Hofstein & Rachel Mamlok-Naaman (2011),
Dr. Samir Najdi (2010), Bennett and Hogarth (2008), Dr Sue Collins, Professor
Michael Reiss and Dr Shirley Simon (2006), Jarvis, Tina; Pell, Anthony (2005),
Jonathan Osborne, Shirley Simon and Sue Collins, (2003), Ferreira (2003),
During the last decade students’ science-related interests and attitude have been studied. Images of science and scientists, and their differentiations according to gender, culture, and socio-economic status have been investigated by multitude of research studies. These studies have concluded that attitude towards science stimulate the science achievement.

The studies related to science exhibition are by: Marshall, Jeff (2006),
H (1997), Thomas, Peter (1997), Ucko David A.; And Others, (1986), Chien,
Annie; Karlich, Lisa (2007), Cohen, David (2007), Davidsson, Eva; Jakobsson,
Anders (2007), Falk, John; Storksdieck, Martin (2005), Falcao,
Douglas; Colinvaux, Dominique; Krapas, Sonia; Querioz, Gloria; Alves,
Fatima; Cazelli, Sibele; Valente, Maria Esther, Gouvea, Guaracira (2004),
Tunnicliffe, Sue Dale; Laterveer-de Beer, Manon (2002), Henriksen, Ellen
Van den Berg, Ed; Baricuatro, Jack; van den Berg, Rosea; Gallos,
Brand, Judith, Ed. (1998) Henriksen, Ellen Karoline (1998), Jennings, Gretchen; Craig,
Michelle L. (1997), Cole, Peggy Ruth; Cutting, Jennifer McGregor (1996),
McCattt, Drew (1996), Borun, Minda (1996), Branca, Barbara (1995), Cutting,
Fortner, Rosanne W. (1986), Sow, A. Lynn; O’Malley, Kimberly J.; Cody,
personalities have found out that science exhibition plays a vital role in developing science attitude, scientific temper, scientific spirit and so on.

The studies related to science education are namely: Archer et al. (2010), Peacock, Jeremy S (2014). Osborne et al. (2003), Heering, Peter; Muller, Falk (2002), Marshall, McClymont and Joyce, (2007). These studies have mainly emphasized that science education develops our society in multiple ways.