Student learning can be greatly increased through human resource programs. Institutions therefore invest in comprehensive programs targeted at human resource development, in order to enable the institutions reach their objectives. This study focused on effectiveness of Strengthening Mathematics and Science Education (SMASE) In-service Training (INSET) as perceived by Chemistry teachers in Gatundu South District. The Kenya Government in collaboration with the Japan Government through JICA (Japan International Cooperation Agency) introduced SMASE INSET. This was in order to overcome challenges which had been identified through a baseline study in 1998. These challenges contributed a great deal to the poor performance in Science and Mathematics subjects. The study dwelt on three main objectives. First, to establish the perceptions of Chemistry teachers, towards the SMASE INSET. Second, to determine whether SMASE, has made any impact in teaching and learning of Chemistry. Third, to investigate the challenges faced by Chemistry teachers in an effort to implement SMASE INSET approaches in teaching and learning of Chemistry. The literature review discussed training and development, evaluation of a training program, teacher effectiveness, SMASE project in Africa among other related areas. The study was an ex-post facto research since the training has already taken place. It took place in Gatundu South District. There are a total of 36 Secondary schools in the District. They include; 33 public and 3 private secondary schools. Only the public secondary schools were involved in the study. The schools were divided into four categories; Boys Boarding, Girls Boarding, Mixed Boarding and Mixed Day. 1 Boys Boarding, 1 Girls Boarding, 2 Mixed Boarding and 8 mixed Day Schools were studied. The study involved 12 Heads of Department (HODs) Science, 24 Chemistry teachers, 240 Form Four Chemistry Students and 1 District Quality Assurance and Standards Officer (DQASO). A total of 277 subjects were sampled. Piloting of the instruments was done in one of the schools 2 weeks before the main study. The school was not included in the main study. The primary data was collected by use of questionnaires to the Chemistry Teachers, HODs Science and Form Four students. An observation Schedule was conducted on Chemistry teachers. An interview schedule on DQASO was carried out. Data collected was analyzed. Presentation of the data was done by use of frequency tables and percentages. In addition figures were used. Explanation of the findings was also done. Results from observation schedule for the teachers were analyzed. The mean score for the Teachers who had attended SMASE INSET and those who had not was calculated and Comparison done. Finally a summary of the findings, conclusion and recommendation was done. The study revealed that, teachers were not implementing the SMASE INSET approaches in the Teaching and learning of Chemistry. There was evidence that teachers reverted to their old ways of teaching after the INSET since it was evident through the observation schedule. The Researcher made some recommendations to the Ministry of Education. Amongst the recommendations; academicians from institutions of Higher Learning should be utilized as the Trainers instead of fellow Teachers and more Teaching/learning resources should be provided to curb the shortage currently witnessed.