find ~~the~~ solutions to their social problems.~~ Therefore, it is necessary to acquire the required information for the solution of problems~~. Within an informative society, learners should get knowledge,- and ability to compare and evaluate the knowledge critically with their understanding. However, rote memorisation is a big hindrance in the production of well-rounded knowledge~~able, well-rounded,~~ and critically thinking skills in the students.

In international literature, different techniques have been described for the development of CT skills such as observation, argumentation, evaluation, students' engagement, and inquiry-based learning (Meltem Duran & Dökme, 2016); discussion, group activities, collaboration, self-evaluation, role-playing, simulation, presentations, and technology (Demir, 2015; Osborne, 2014; Savich, 2009; Tok, 2012); explicit instruction, engaged pedagogy, questioning, inquiry, and project-based methods (Hooks, 2010; Orlich, Harder, Callahan, Trevisan, & Brown, 2012); and cooperative/collaborative learning, conversation, interaction, debates, and problem-solving (Fung, 2014; Osborne, 2014).

Commented [NH5]: THIS IS BEING REPEATED. PLEASE CLUMP IT AS ONE PARAGRAPH AND DECIDE WHERE TO PUT IT.

In ~~the Pakistani context~~Pakistan, the education policy documents, that is, the National Education Policy (NEP, 2009) and the National Curriculum (NC, 2006) regarding science subjects (physics, chemistry, and ~~biology~~biology) focus on developing CT skills among the secondary school science students. These documents suggest the cultivation of CT skills among students to produce useful citizens, who can effectively face the challenges of the world. In these documents, there are different suggested pedagogical practices for CT skills development among secondary science students like student-centred pedagogies, the spirit of inquiry, problem-solving, and team-work (NEP, 2009); questioning, problem-solving, discussion, cooperative learning, debates, and students' involvement (NCP, 2006); student-

centred, activity-based, interactive, participative practical, laboratory work, group-work, inquiry-based, diagrams, flowcharts, graphs, fieldwork, and inquiry-based approaches (NCC, 2006); group work, team-setting, formulation of questions, audio-video presentation, diagrams, graphs, flowcharts, demonstration, investigation, debates, and drawing (NCB, 2006).

Commented [NH6]: What do NCC and NCB stand for? Pls spell out

The above discussion shows the significance of CT in international and national context regarding science education. Most of the Pakistani education policy documents ~~are focusing~~focus on producing independent and critical thinking~~er~~ students ~~to achieve this aspect~~. Despite given the importance by education policy documents, the performance of the students on questions related to CT is low. It is allegedly attributed to rote memorisation, the most used practice in traditional classrooms in Pakistan. In the Blooms' taxonomy, the last three stages (analysis, synthesis, and evaluation) are considered higher-order skills. These skills are usually assessed with questions relating to~~of~~ how and why, demanding logic and rationale to answer the questions related to higher-order skills. Most of the students ignore such ~~type~~ questions and leave them unattended in the answer sheets. In the Pakistani context, the age of secondary school students is approximately between 13-16 years, which is the logical reasoning stage (12 years according to ~~to onward as cited by~~ Piaget ~~in his age stage model)~~. At this stage, CT skills should be promoted among students, since literature (Ramos, Dolipas, & Villamor, 2013) suggests that these~~CT~~ skills can be developed effectively through different pedagogical practices incorporated by teachers.

The above ~~described~~ literature describes~~underscores~~ different pedagogical practices for the development of CT skills in science students. Therefore, it was of great significance to conduct a study to develop an understanding of how secondary