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Social Cognitive and Affective Neuroscience Among Students

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TOPIC: SOCIAL COGNITIVE AND EFFECTIVE NEUROSCIENCE AMONG STUDENTS

CHAPTER – 1

INTRODUCTION

1.1 INTRODUCTION

An interdisciplinary area known as social cognitive and affective neuroscience (SCAN) links social science, psychology, and neuroscience to better understand how the brain interprets social and emotional data. This area of research has significant consequences for students, both in terms of tackling the various obstacles they encounter in their academic path and comprehending typical growth trajectories. This essay explores the salient features of SCAN as it applies to students, emphasizing the need of social cognition and emotion management for both academic and personal growth.

The idea that social cognition—the way we see, analyse, and react to social information—is essential to human interaction and behaviour lies at the heart of SCAN. In order for students to successfully traverse the intricate social settings seen in schools and colleges, social cognition is essential. This covers responding to peer pressure, comprehending social hierarchies, and making and keeping friends. According to neuroscientific research, regions like the anterior cingulate cortex, the amygdala, and the prefrontal cortex are essential for social cognitive functions. The amygdala is essential for processing emotions and responding to social dangers, whereas the prefrontal cortex is engaged in making decisions and comprehending the viewpoints of others.

The capacity to control and react to an emotional experience in a healthy and adaptive manner is known as emotion regulation, and it is another essential component of SCAN. Students who are unable to effectively regulate their emotions may find it more difficult to manage stress, maintain concentrate on their work, and participate in constructive social relationships. Emotional dysregulation can result in a variety of

disorders, including as anxiety, depression, and behavioral problems, all of which can seriously impair general well-being and academic achievement. Emotion regulation is underpinned by intricate neurological systems involving the prefrontal cortex and limbic system, which includes the amygdala. According to research, by encouraging modifications in these brain circuits, techniques like mindfulness and cognitive-behavioral techniques can improve emotion control. Peer relationships provide an environment in which the link between emotion regulation and social cognition is especially visible. While harmful peer connections, such bullying and social exclusion, can have negative effects, positive interactions are linked to better mental health and academic success. SCAN research has shown that same neural pathways to those activated by physical pain are also activated by the brain's reaction to social pain, such as rejection or exclusion. This emphasizes the significance of creating inclusive and encouraging learning environments in schools and the significant influence that social encounters can have on a student's emotional state.

Teacher-student interactions are another important sector where SCAN insights can be applied, in addition to peer connections. The social and emotional atmosphere of the classroom is greatly influenced by the teachers. In addition to being well-versed in their field, effective teachers also possess strong social cognition and emotion management skills. They are able to identify and address the emotional needs of their pupils, foster a caring and understanding environment in the classroom, and set an example of acceptable emotional reactions. Positive interactions between teachers and students can improve learning by lowering stress and raising engagement, which in turn helps students perform better academically. This is supported by neuroscience research.

For students, the digital age offers both new opportunities and problems in the areas of social cognition and emotion regulation. The way students engage with one another and build social networks has changed as a result of social media and other online platforms. These platforms can be beneficial for social contact and support, but they can also have unfavorable effects including cyberbullying, social comparison, and a decline in in-person relationships. The impact of digital interactions on behaviour and the brain is a growing area of attention for SCAN research. Overuse of social media, for example, has been connected to changes in brain activity in regions related to

social cognition and reward processing, which may have an impact on students' emotional health and social skills in the real world.

SCAN also provides information on the ways in which various educational interventions might enhance the social and emotional growth of kids. It has been demonstrated that curricula that incorporate social-emotional learning (SEL) enhance students' academic achievement, emotional control, and social skills. The main goals of SEL programs are usually to assist students in gaining competences including social awareness, self-awareness, self-management, relational skills, and responsible decision-making. According to neuroscientific research, SEL may alter the structures and processes of the brain that are associated with these competences, offering a neurobiological explanation for the advantages that have been seen.

Individual variations in pupils' social cognition and emotion management should also be taken into account. These processes can be influenced by elements like cultural context, early life experiences, and genetic predispositions. Children who face early adversity, such as trauma or neglect, for instance, may have changes in brain regions related to social processing and emotion control, which may have an effect on how well they operate in both social and academic settings. The neurological mechanisms underlying these individual variances are being better understood because to SCAN research, which is also assisting in the development of focused interventions for at-risk pupils.

Furthermore, developing age-appropriate therapies requires an understanding of the developmental trajectory of social cognition and emotion control. Studies show that these skills continue to grow between childhood and adolescence, with notable modifications happening in adolescence. Increased emotional reactivity and social sensitivity are common during adolescence, and this is consistent with the continuous growth of the brain regions involved in these processes. Promoting healthy social and emotional development can be accomplished more successfully by using educational practices that consider students' developmental stages.

To sum up, social cognition and affective neuroscience offer important new perspectives on how kids understand, navigate, and act in their social and emotional environments. The brain foundations of social cognition and emotion regulation can

be better understood by educators, parents, and legislators to better assist children' growth. This entails developing inclusive and encouraging learning settings, putting SEL programs into practice that work, and understanding the influence of digital interactions. Furthermore, understanding individual variances and developmental paths might assist in customizing therapies to fit each student's particular needs. In the end, incorporating SCAN research into teaching practice has the potential to improve students' general wellbeing in addition to their academic performance.

1.2 STATEMENT OF THE PROBLEM

Because of its potential to provide light on how social and emotional processes affect learning and development in educational settings, the topic of social cognitive and affective neuroscience, or SCAN, has attracted a lot of attention. Notwithstanding significant progress in comprehending the neurological mechanisms that underlie these activities, there is still a deficiency in efficiently converting this information into useful pedagogical approaches. Understanding how these neural mechanisms affect memory, learning, and decision-making is important. Other important issues to look into include how emotional states like stress, anxiety, and motivation affect cognitive function and learning experiences. Lastly, social interactions like peer relationships and teacher-student dynamics can have an impact on neural processes and learning outcomes. Personalized educational techniques also depend on the recognition of individual differences in social cognition and emotional processing, which are influenced by personality traits, cultural background, and developmental stages. In order to address these issues, a multidisciplinary effort is needed to close the gap between SCAN research and educational practice. This will eventually result in the development of evidence-based tactics and interventions that boost students' social and emotional competencies and advance both their academic and personal growth.

1.3 OBJECTIVE OF THE STUDY

- To evaluate how social cognitive and affective brain functions develop.
- To examine brain functions that effect education and scholastic achievements
- To assess social settings that affect students' wellbeing and brain function.
- To offer suggestions to improve normal, emotional and social brain.

1.4 SCOPE OF THE STUDY

The purpose of this research is to better understand how affective and social cognitive neuroscience interact with regard to student populations. The field of social cognitive and affective neuroscience, or SCAN, studies how social and emotional activities are mediated by brain functions. Gaining knowledge of these processes can help us understand how students behave, learn, and feel about themselves. The goal of the research is to understand how social interaction, emotion regulation, and academic achievement are impacted by these processes by investigating the neurological foundations of these processes in students. This information may be used to improve student engagement and promote their emotional and cognitive development through educational practices, interventions, and policies.

1.5 LIMITATION OF THE STUDY

- A small sample size may not accurately reflect the entire student body.
- Bias may result from voluntary or non-random involvement.
- Some tools might not be entirely accurate or legitimate.
- Inability to determine causality.
- Outside variables may have an impact on the outcomes.
- Results might not hold true for those who are not students or from other cultures.
- Confidentiality and informed consent are two things that need to be handled.
- It might be challenging to separate and research social and affective processes.

CHAPTER – 2
REVIEW OF LITERATURE

CHAPTER – 2

REVIEW OF LITERATURE

2.1 SOCIAL AND COGNITIVE BEHAVIOUR

Atia (2017) shown how well mind maps work for nursing students as a learning aid. In order to improve nursing students' learning, this study looked at how well the mind mapping learning technique works. The two equal groups that make up the sample are N=100 for the control group and N=100 for the experiment group. A mental map was utilized in the intervention programme in two ways: as a learning tool and for mind mapping by sketching the subject. A quasi-experimental design featuring a control group and pre-post evaluation was used in the study, which was carried out at the Technical Institute of Nursing in Egypt, which is connected to Menoufia University. The questions were self-reported and represented different cognitive levels using a 5-point Likert scale on an assessment form and a written test. Using multiple linear regression analysis and Spearman rank correlation.

Mynbayeva, Vishnevskaya, & Sadvakassova (2016) carried out an experimental study on university students' development of creativity. The purpose of this study was to identify the students' primary motivation type and their degree of creative development. The 69 second- and third-year undergraduate education majors from AI-Farabi Kazakh National University in Kazakhstan make up the study's sample.

Research methods include testing to determine a person's predominant motivational activity type, critical analysis, simulation, and systematization of the principles of creativity through the comparison of two pictures (the real and ideal selves). To analyze the outcome, descriptive and interferential correlation were used. The outcome demonstrates that there is a relationship between an individual's primary motive in their activities and their degree of creativity.

Cheung (2012) Examine the opinions of early childhood educators regarding effective, innovative teaching methods. He also looked into how much instructors' actual practices reflect their views. Using a purposive sample strategy, the researcher used 15 Participants were chosen from among Hong Kong's early childhood educators. Data was gathered via 45 classroom observations, individual structured

interviews, video, and audio recordings of the teaching strategies, student interactions, and performance. According to the descriptive study, children's creativity is enhanced when they are given an inspiring setting, flexible time management, lots of possibilities and freedom to explore, express, and engage, and the opportunity to ask open-ended questions. The majority of teachers, according to the results, had similar views about what constitutes excellent creative practice, and these views were largely consistent with what the literature had to say.

Ott & Pozzi (2012) carried out a study on how children's use of digital games can foster creativity. They discussed whether or not children's creative abilities and attitudes may be fostered by digital mind games. Thirty primary school students made up the study sample. children between the ages of 8 and 10 in the third and fifth grades, 26 of them were Italian females from Genoa. To improve reasoning abilities, mind games like puzzles and brainteasers were employed in this experimental investigation Review of Related Literature 11. A monitoring sheet is employed to directly observe various elements of conduct, including inventiveness and attitudes. Every single student's performance was graded as "A," "B," or "C" depending on the year. The results of the descriptive analysis demonstrated that the intervention group's creative attitudes rose.

Huang et al., (2017) studied the impact of concept-mapping and cooperative learning interventions on students' acquisition of critical thinking and skill. 170 fifth-grade students (n = 54) made up of 87 boys and 83 girls were placed in a cooperative learning condition. two conditions: a control condition (n = 59) and a concept-mapping condition (n = 57). Differential Teams of five were assembled, and lessons were taught and discussed using concept maps. Tests are administered before, after, and in follow-up under experimental circumstances. With repeated measures, an ANOVA was used to examine the impact of the various learning strategies. The study included both Independent and Paired t-tests to verify noteworthy alterations. The findings showed that group projects or idea mapping were more helpful in helping students develop their critical thinking skills than working one-on-one with conventional practice techniques.

Kaddoura, Van-Dyke, & Yang, (2016) examined how nursing students' critical thinking skills developed in response to concept mapping as an obligatory

pathophysiology and pharmacology course throughout their first year of a Bachelor of Science in Nursing. A method of intervention. The study's sample consists of two groups: the intervention group (n = 41) received standard didactic lecturing combined with idea mapping, and the control group (n = 42) received traditional didactic lecturing alone. A critical thinking test from Health Education Systems, Inc. was given as part of the pretest and post-test design of the study in order to collect data. For analysis, chi-square tests, linear regression, and independent t-tests are employed. According to the study report, concept mapping is a helpful teaching technique that helps pupils develop their critical thinking.

2.2 COGNITIVE BEHAVIORAL NEUROSCIENCE

Ghabanchi & Behrooznia (2014) examined how brainstorming as a prereading technique affected EFL learners' reading comprehension and critical thinking (CT) skills. There are two groups of participants in this study: the experimental group has twenty-five EFL learners and the control group has 29. 45 different options reading passages from the 2005 film Flash The "Watson-Glaser Critical Thinking Appraisal" (CTA) and the TOEFL Reading were used to assess the learners' CT proficiency.

The data was analysed using independent samples t-Teste. The post-test results showed that EFL learners' CT and reading comprehension skills are positively and significantly impacted by brainstorming techniques.

Magno (2010) examined how metacognition affects critical thinking abilities. For this study, 240 college students from various universities in the Philippine National Capital Region were chosen. the Inventory of Metacognitive Assessment (MAI) The Watson-Glaser Critical Thinking Appraisal (WGCTA), developed by Schraw and Dennison, was used to collect data. Its criteria included inference, recognition of assumptions, deduction, interpretations, and evaluation of arguments. The impact of metacognition on critical thinking was ascertained using structural equation modelling (SEM) as a latent variable. The correlation between the metacognition and critical thinking components is determined by the Pearson r value. The outcome demonstrated a significant ($p<.05.$) pathway from metacognition to critical thinking. The investigation also demonstrated the significance of all underlying components for critical thinking and metacognition.

D’Antoni, Zipp, Olson, & Cahill (2010) An examination was conducted on the correlation between critical thinking and the mind map learning approach. A randomization process was used to allocate the sample of 131 first-year medical students to either the standard note-taking (SNT) group or the mind group. Map (MM) group in the training session. A post-Health Sciences Reasoning Test (HSRT) was administered after a pre- and post-quiz based on the text passage were given to the mind map and note-taking groups. Both the mean pre- and post-HSRT total scores and sub-scores between groups were evaluated using ANOVA, as well as changes in the mean pre- and post-quiz scores between groups using independent samples t-tests. The Mind Map Assessment Rubric was used to gauge the depth of the mind map (MMAR).

Wilgis & McConnell (2008) determined how well idea mapping works for graduate nurses in terms of helping them access and develop critical thinking. Descriptive analysis was used to assess graduate nurses' critical thinking. This research includes a convenience sampling and descriptive comparison were utilised to choose the graduate nurses (n = 14). To gauge students' critical thinking, the Concept Map Care Plan Evaluation Tool by Schuster (2002) was modified. Pre- and post-concept maps were where the data was gathered, and they were graded and scored as 14.071 and 16.428 correspondingly. Post-concept maps significantly improved, according to a paired sample t-test ($t = -2.797$; $df = 13$; $p = .008$). Thus, it was observed that concept mapping was a helpful teaching technique and a reliable way to assess students' mental processes.

Abd El-Hay, El Mezayen, & Ahmed (2018) examined the impact of concept mapping on undergraduate nursing students' knowledge and problem-solving abilities. The 60 undergraduate nursing students that are chosen for the study's problem-solving sample by applying a straightforward random technique, dividing the participants into thirty second-year students and thirty fourth-year students. The data was gathered utilising a quasi-experimental methodology, a questionnaire to gauge students' understanding of concept mapping, a case study rubric, an assessment sheet for problem-solving abilities, and students' perceptions of using concept maps. To analyse the gathered data, solve the t-test, Chi-square, and correlation problems. The outcome demonstrated that students' understanding of concept maps, the simulation case study rubric, and their problem-solving abilities had significantly improved.

Arifuddina, Mastuangb, & Mahardikac (2017) carry out an experimental study to enhance students' ability to solve physics problems by utilising the direct instruction model's argumentation method. This is the design for the pre- and post-tests. The study's sample include 92 students who are teachers of Physics at Lambung Mangkurat University in Banjarmasin, Indonesia. The data was gathered using the argumentation strategy and problem-solving test instrument. Normalised gain score analysis was performed on the data. According to the analytical report, the average score on the pretest, which was 28.89, increased to 71.74 in the post-test with an N-gain of 0.60. The study found that integrating the argumentation technique into the direct instruction model can enhance students' problem-solving abilities.

2.3 STUDY ON PROBLEM-SOLVING AND COCEPT MAPPING: INSIGHTS FROM SOCIAL COGNITIVE AND AFFECTIVE NEUROSCIENCE

Yu, Fan, & Lin (2014) investigated activities for context-based learning that improve eighth-grade students' problem-solving abilities. Three steps were taken: viewing detective films, creating a context-simulation exercise, and presenting the project design. Within the group receiving assistance. Over the course of 14 weeks, 103 eighth-grade students—52 males and 51 females—from a Taipei, Taiwan junior high school participated in this study. PSP application, problem-solving, and perception the three assessments that are used to collect data are performance-related. The students' performance in problem-solving was examined using the structural equation model, descriptive statistics, and Chi-Square statistics. According to the results, students can build a thorough and full Problem-Solving performance with the help of the three-stage context-based problem-solving learning activity. Additionally, the outcome suggests that context modelling is advantageous for developing students' skills.

Kamble & Tembe (2013) examined how the concept mapping technique affected the pupils' ability to solve problems. The six-week study employed a pre-test and post-test quasi-experimental design methodology. The illustration of 84 University of Mumbai third-year undergraduate mechanical engineering students participated in this study. 42 students made up each of the experimental and control groups. Two different kinds of tools were administered: 1) the Well-structured Problem-Solving Test (WSPST) 2) An unstructured problem-solving test (ISPST) and 3) A Concept Mapping satisfaction survey. Adopting a concept mapping method can lead to a higher mean post-test score

in problem-solving for the experimental group ($t = 2.64$, $p < 0.05$) according to analysis of the t-test for independent samples.

Ulusoly, Turan, Tanriverdi, & Kolayis (2012) compared how training pupils thought they were doing at solving issues. 168 trainee students from Kocaeli University's education and science faculties were chosen at random for this study. Heppner and colleagues developed the "Problem Cozme Envanteri" inventory for data collecting. The dosage of Petersen (1993) was given. The T-test is used to examine the data for independent groups. The findings indicate that the trainee students' perceptions of their ability to solve problems differ considerably depending on the faculty of education ($p<0.00$, $t=5.58$), but not significantly depending on gender ($p>0.82$, $t=0.23$).

Zwaal & Otting (2012) found that including concept mapping into a curriculum for problem-based learning improves the process of problem-based learning. There were two studies conducted on the intervention. Four PBL groups were used in the first trial, with two groups (N=35) employing concept mapping. In the second study, idea mapping was mandated for three out of seven groups (N = 58). As a result, 11 PBL groups including 93 first-year international hotel school students make up the study. The questionnaire, which has three sections and a total of 17 questions, was used to gather the data. The PBL sessions were also recorded using a voice and video recorder. The gathered data is analysed using ANOVA, ANCOVA, and descriptive statistics. Two studies are covered in this publication. Findings indicate that pupils collaborating with.

Siebert & Kunz (2016) created and verified a proactive decision-making scale that is conceptually sound and psychometrically sound. The sample is made up of five studies with over 4,000 full-time master's students from different nations. Students enrolling in courses with a business focus. The research had Six theoretically unique dimensional components, which were discovered and validated through the use of a 7-point Likert scale questionnaire, were shown to be reasonably valid and trustworthy after several phases of data collecting. There are six dimensions: 1) methodical goal-setting, 2) methodical information-gathering, and 3) methodical alternative-finding. (4) making decisions with a decision radar (proactive cognitive skills); 5) demonstrating initiative; and 6) making an effort to get better (proactive personality

attributes). The data was analysed using factor analysis, correlations, and squared correlations.

Kilic & Kizilgol, (2016) examined how employing concept mapping and the conventional approach affected students' academic performance in learning the foundational concepts of cost accounting. The research uses a matched quasi-experimental design. Group under pretest-post-test control. 28 students from the experimental group (concept mapping) and 28 students from the control group (conventional technique) make up the study's sample. A descriptive analysis was performed in this investigation. The findings demonstrate that idea mapping has a greater impact on the participating students' academic achievement levels. Additionally, it proved how helpful concept mapping is in enhancing the effectiveness of in-class discussions.

2.4 EFFECT OF IDEA MAPPING ON LEARNING LEVELS IN STUDENTS

Aghakhani, Sharifnia, Eghtedar, & Torabizadeh (2015) examined how idea mapping affected students' learning levels in the Urmia University of Medical Sciences nursing care of patients with glandular disorders course. This study uses a pre-test/post-test approach and is quasi experimental in nature. The study's sample consists of 28 two groups of nursing students: the experimental group and the control group. The paired t-test was used to compare the means of the scores from the pre- and post-tests. The findings indicate that there was a significant difference ($P < 0.05$) in the learning level of the pupils in the experimental group. Additionally, it demonstrates how idea mapping, a metacognitive intervention, can support students' in-depth learning.

Akbari, Mofrad, & Dabirian (2014) I examined how idea mapping affected the nurses' clinical decision-making abilities in the critical care unit (ICU). 42 nurses (7 males and 35 females) made up the study's sample, and information was gathered using carried out using a self-administered survey. This study included baccalaureate nurses working in a critical care unit and used a pretest-post-test design with a non-equivalent control group. A substantial difference ($P<0.001$) was observed in the mean scores from the pre-, post-, and retention tests. The t-test analysis demonstrated that the idea mapping technique had a noteworthy impact on the clinical decision-making abilities of nurses.

Gerdeman, Lux, & Jacko (2013) investigated and investigated the use of idea mapping as a teaching method to help undergraduate nursing students strengthen their critical thinking abilities. Eight nursing undergraduates served as the study's sample. Content the research methodology employed in this study is analysis, which aims to draw conclusions from qualitative data in order to offer fresh perspectives and clinical expertise on this teaching approach. The information gathered with Tanner's Clinical Judgement Model-designed idea mapping rubric. The outcome demonstrated how the concept mapping exercise and rubric help students develop their clinical judgement skills and help them make better clinical decisions.

Kazemi & Moradi (2019) examined how idea mapping and practice affected the complexity and accuracy of speech. The study's sample consisted of sixty intermediate English language learners from Yasouj's Bozorgmehr and Andishmand language institutes. Iran. Pre- and post-tests, treatments, and two groups—the experimental (concept mapping) group and the control (rehearsal) group—were used in this study. Two speaking tests were given out: a pre-test and a post-test. The data was analysed using T-tests and ANOVA. The outcome showed that concept mapping, as opposed to rehearsal, had a statistically significant impact on speaking complexity and accuracy. It also showed that, in terms of complexity, the idea map group fared better than the rehearsal group.

Sugito, Endang, Hartono, & Supartono (2017) examined the use of problem-posing and presentation techniques to improve communication skills. They used a pre-test and post-test design in their investigation. Students in the seventh grade from Junior High School, with fourteen girls and twenty boys. There were two cycles to this research, with four steps in each cycle being planning, activity, observation, and reflection. This study measured the most popular methods of data collection in communication skill students: interviews, observations, and questionnaires. It also employed daily tests (pre- and post-tests) to gauge how much the students' achievement had improved. The data were analysed using descriptive and correlational analysis. The end result showed that using problem-posing and presentation techniques to teach and understand science can improve students' communication skills, courage, confidence, and sense of personal responsibility.

Chik (2016) examined how to improve students' communication skills through peer education. Fifty kids from Kedah, Malaysia's Regional Development Group B made up the study sample. This study used observation and a 15-item questionnaire. Survey in order to gather the information. The data was analysed using a two-way ANOVA. The statistical outcome showed a significant difference between the dependent variable, students' communication skills, and the independent variables, students' group, feeling, and support, as well as student group activities like group discussions, group presentations, broken radioactivity, and crossword puzzles.

Bera & Mohalik (2016) examined the impact of the concept mapping approach on secondary science students' cognitive processes. 100 samples total are used in the study, 50 of which are grouped as the experimental group and 50 as the control group based on matching by an assessment of intellect. Both the conventional and the concept mapping strategies are used during the 12-week course of treatment. For the aim of gathering data, a self-developed achievement test covering the class IX textbook of the West Bengal Board of Secondary Education, India was given to the experimental and control groups as a pre-test and post-test. The t-test and Gain Scores were used to examine the gathered data. The outcome demonstrated that students exposed to the idea mapping strategy outperformed those exposed to the conventional teaching method in their application, Iksan et al (2012) examined the degree of communication proficiency among college students. A total of 533 Universiti Kebangsaan Malaysia final year students made up the study's sample. A questionnaire that was self-administered was used to gather the data also evaluated twelve components of communication abilities, including as written, oral, and social conduct. In this study, descriptive analysis and correlation were used to analyse the data. With $r > 0.08$ in each subconstruct, the questionnaire's reliability was deemed to be good. The analysis's conclusion showed that college students had developed strong communication abilities.

Out of the nine reviews pertaining to communication skills, two were conducted by survey methods and seven were experimental studies. Chalk-up's integration with Learning Management Systems (LMS), problem-posing and presenting techniques (Sugito et al., 2017), and metacognitive prompts (Teng & Reynolds, 2019).

2.5 IMPACT OF A COCEPT MAP TEACHING APPROACH ON STUDENTS CRITICAL THINKING SKILLS

Van Leeuwen & Janssen (2019) investigated the connection between student collaborative procedures and results and teacher guidance tactics. A review of 66 studies is included in the report. It is an examination of both quantitative and qualitative research employing Examine thematic analysis and coding of group education. In this investigation, descriptive statistics were employed. The findings indicate that there is a positive correlation between student collaboration and many facets of instructor assistance. Opportunities for students to participate in cooperative activities that enhance their learning occur throughout student cooperation.This review emphasises how crucial and difficult it is for teachers to facilitate collaborative learning.

Aguiar et al., (2019) investigated the application of idea mapping in a collaborative setting to identify the opinions of academics and assist them in expressing their viewpoints within the framework of the concepts of pedagogic frailty and resilience. A sample was obtained. as a team of five coworkers from the University of Surrey in Guildford, UK, who are developing a new undergraduate curriculum inside a biochemical science department. To gain some understanding of how concept mapping could scaffold each stage of the collaborative process, a qualitative single-case study was carried out. The methods utilised to gather the data included an online survey, individual concept maps, group discussions, collaborative concept maps, and evaluations. According to the descriptive statistics study, using the engaging map in conjunction with the questionnaire helped participants become more aware of.

Torre, Daley, Picho, & Durning (2017) investigated the possibility of using group idea mapping as a teaching tool to promote collaborative learning. The study's sample comprises 39 fourth-year medical students from the Department of Bethesda, USA: Uniformed Services University of Health Sciences, Department of Medicine. The Group idea maps served as a means of gathering information. The development of the group maps was predicated upon a clinical vignette. The data analysis involved the use of descriptive statistics and thematic analysis of the student evaluations. According to the reviews, pupils relished the exercise's collaborative format and its

associated knowledge-sharing activities. Additionally, group maps can show various knowledge structures.

Maria, Dimitris, Garifallos, Athanasios, & Roumeliotis (2015) one can determine the degree of conceptual understanding by using concept mapping. The research sample consisted of students who took the "Principles of Marketing" course at Central Macedonia Technological Educational Institute, Greece. Students were split into groups of five at the start of the semester, given the term "marketing" as their major theme, and instructed to make concept maps. The concept map exercise was repeated at the end of the semester. The pre- and post-concept maps were examined using the established Gowin and Novak scoring standards for concept mapping. It revealed significant changes, and descriptive analysis demonstrated that students were inspired to develop their own marketing realities by using concept maps.

Githae, Keraro, & Wachanga (2015) examined the impact of the Collaborative Concept Mapping Teaching Approach (CCMTA) on students' progress in biology, thereby addressing the issue of poor teacher instruction. The Solomon Four Non-Equivalent Control Group Design, a quasi-experimental research design, was employed in this study. This study used two experimental and two control groups, E1 & E2 and C1 & C2, respectively, with a pretest and posttest design. Four biology professors and 202 biology students from four secondary schools in Kenya's Gucha area made up the sample. The Biology Achievement Test was used to gather the data (BAT). The gathered data was analysed using ANCOVA, t-test, and one-way ANOVA. To account for potential pre-existing differences, the sampled groups' science scores from the Kenya Certificate of Primary Education (KCPE) were included as variables.

Hoaglund, Birkenfeld, & Box (2014) found that pre-service candidates function under the presumption that ongoing, job-integrated learning for education is the route to better learning for pupils. Pre-service teacher candidates served as the sample, and undergraduate teachers provided a controlled environment for them to practise their collaborative abilities. programme in education at Samford University. Four to five candidates each group were paired with a faculty mentor. Formative assessments, mentor monitoring, and data collection every several weeks were used to acquire the data. To analyse the data, descriptive statistics were employed. Following the Professional Learning Communities teaching, the results demonstrated that applicants

who were involved in this approach were more inclined to support decisions, own up to mistakes, and discuss concerns. In the context of undergraduate teacher education, professional learning communities can offer the essential transition from candidate.

Hwang, Shi, & Chu (2011) examined the use of concept maps in the creation of Mindtools to facilitate group u-learning activities. Pre-test and post-test designs were used in the investigation. Seventy Tainan primary school pupils make up the study's sample. County: 21 people in control group A, 24 people in control group B, and 25 people in an experimental group.1) Collaborative mind mapping through observation, 2) Traditional idea mapping through observation were the methods used to gather the data. 3) U-learning system observation; and 4) Interview. To examine the data, ANCOVA and a one-way ANOVA were used. The analysis's findings demonstrated that students' learning achievement was noticeably higher while using the collaborative Mindtool than when using the other methods.

Topaloglu & Tekkanat (2015) established the reciprocal association between the degrees of information technology utilisation and literacy. A sample of 200 undergraduate students from Trakya University in Turkey was used. for the investigation. It is a survey approach and questionnaire designed to gauge undergraduate students' information technology usage and literacy levels. The analysis and reliability were assessed using One-Way ANOVA, Independent Sample t-test, and Cronbach Alpha internal consistency test, in that order. The findings indicate that undergraduate students have more basic ICT skills, analysis and development skills, and internet skills than problem-solving skills.

Pheeraphan (2013) logy (ICT) in the classroom to improve students' readiness for 21st-century learning. The study's sample included 69 undergraduate students and 22 graduate students who were enrolled in two distinct 4-month courses. This study's foundation is learning. Four useful ICT integration functions were included in the theories and student-centered approach: dynamic content presentation, information access, production and sharing, interaction, and reflection. Pretest and posttest experimental designs were used in the investigation. Data were gathered using a self-assessment instrument. Effect size (d) and the paired t-test were used to analyse the effects of ICT integration in the classroom. According to the analytical report,

integrating ICT into the classroom might greatly and favourably improve graduate and undergraduate students' 21st century learning skills.

2.6 THE ROLE OF METACOGNITIVE SKILLS IN DEVELOPING CRITICAL THINKING

Ladbrook & Probert (2011) examined the degree to which instructors encouraged and pupils displayed critical information technology literacy. As a sample, they gathered 188 English teachers and fourteen-year-old class ten pupils from three coeducational secondary schools in Auckland, New Zealand. Utilising a diary and survey on focus groups, the study investigated students' self-reported research practices and teachers' perceptions of students' online information literacy. According to the descriptive data and analysis, pupils have little access to internet information and critical assessment abilities, and teacher pedagogical practice does not fulfil these needs. The study argues that in addition to professional development in online and offline information literacy pedagogical practices, educators should become comfortable and confident working with various online text formats.

Carr, Iredell, Newton-Smith, & Clark, (2011) assessed the impact of the improved information literacy programme on the information literacy of medical students and found out how the students thought they knew their own information literacy. The instance of this study is made up of 197 University of Western Australia (UWA) first-year medical students for the intervention group and 179 second-year medical students for the comparison group. In this study, the pretest and posttest design were used. The questionnaire is related to the Standards and Information Skills Survey for Assessment of Information Literacy in Australia and New Zealand (ANZIIL). Higher Education (ISS) was utilised to gather the knowledge skills that students believed they have. Information literacy abilities are now more explicitly included in the curriculum for both teachers and students, according to an ANOVA and Effect Size analysis of the teachers' coaching.

Ozdemir, Akbaş, & Cakir (2009) evaluated the attitudes and literacy abilities of pre-service teachers. They discovered a link between the information literacy abilities of pre-service instructors and their perspectives on online learning. 235 teachers-in-training were chosen to have their attitudes and literacy levels assessed by Kirikkale University in Turkey's departments of elementary school teaching, scientific teaching,

and Turkish language teaching. The information was gathered using two questionnaires: the Distance Education Attitude Scale (Agir, Gur, and Okcu, 2008) and the Information Literacy Scale (Ademir, 2004). There is no discernible correlation between individuals' views towards distant learning and their information literacy levels, according to Pearson's Moments Multiplication Correlation Coefficient.

Setyowati & Raharjo (2019) examined the social skill development of pupils who used concept mapping to aid in their learning. Pre- and post-test control groups were included in the study's quasi-experimental design. Purposive sampling was the method used to choose the sample. Of the sample, forty fourth graders elementary pupils from the Pattimura Cluster, Genuk Sub-District, Semarang City, Indonesia; forty fourth grade elementary students made up the control group. The data for the study was gathered using non-test methods such documentation, interview protocols, and observation protocols. The data were analysed using descriptive analysis, N-Gain, and an independent sample t-test. The findings showed that concept mapping is an effective way to help students in social studies classes improve their social skills.

Daraee, Salehi, & Fakhr (2016) carried out the study and contrasted the social abilities of pupils in gifted schools with those in regular schools. Two hundred students make up the sample; they were chosen from eight regular high schools and eight special talent high schools. by cluster sampling from various locations throughout Iran's Alborz province. A questionnaire designed to evaluate pupils' social abilities was used to gather the data. Students in regular and gifted schools were assessed for their social skills using the independent t-test. The results of the analysis indicated that although there was no discernible difference in other components, children in talented schools had considerably greater levels of inappropriate social skills and overconfidence.

Sihem, 2013 investigated the level of social orientation among the academic staff and students at Jazan University's College of Business Administration in Saudi Arabia.The survey method was used in this study. There are 100 teachers in the sample, and 100 students from Jazan University's College of Business Administration. Information gathered via a questionnaire about education's social duty. To analyse the data, the researcher employed a descriptive statistic. The findings showed that while 70% of students were aware of their social responsibilities, just 15% had taken any kind of social action.

2.7 EXAMINIG THE BELIEFS OF EARLY CHILDHOOD TEACHERS AND THEIR INFLUENCE ON TEACHING PRACTICES

Dusi, Steinbach, & Messetti (2012) investigated and confirmed the methods used by educators and organizations to educate democratic citizenship from an intercultural standpoint. It is a study of exploration. The sample for the study consisted of 47 teachers (8 preschool teachers, 16 from elementary school, 15 middle schools, and 8 secondary schools) from 13 educational institutions spread over three northern Italian regions: Emilia Romagna, Veneto, and Lombardia. The data was gathered via open-ended questions on citizenship education and interviews. Seven main themes emerged from teachers' descriptions of practical activities: involvement, resolving conflicts, listening to others, identifying differences, belonging, setting norms jointly, and creating communities. The gathered data were translated into transcriptions and verbatim. After the coding was examined, it became clear that although some educators conceptualised civic education in vague terms, others based it on morality.

Of the six reviews on social skill, two used survey methods and four involved experimental studies. A social skill was developed through the application of the Concept Mapping Instructional Strategy (Setyowati et al., 2019; Chand at el., 2018; Nwaubani et al., 2016). Sihem (2013) demonstrated that while 70% of students are aware of their social responsibilities, only 15% really take part in social action. According to Dusi, Steinbach, and Messetti (2012), some educators had unclear ideas about citizenship education, while others grounded it on ethics and multiculturalism to create an inclusive definition of citizenship. Students' social skills in social studies learning are significantly enhanced by the idea mapping approach, as demonstrated by Setyowati et al. (2019); Chand at el, (2018); Nwaubani et al. (2016).

According to Bernard (1965), motivation is the power behind the creation, maintenance, and regulation of interest. Said to be a component of motivation, it's critical to inspire pupils to participate fully in the teaching and learning processes, with the goal of making learning enjoyable for students and inspiring them to keep studying. The student's natural desires are what drive them to play a significant role in educational activities. One crucial component of emotional intelligence that helps students perform better academically is self-motivation. In the context of this study, self-motivation demonstrates students' interest in learning about and comprehending their goals in order to attain success.

Emotions are a vehicle for self-motivation. A person's emotions influence how they react to other people and their surroundings, which in turn influences the pattern of adjustment that will be absorbed into their existence (Kamarudin, 1989). It is important to harness children's emotional structures to spark their curiosity about learning. It should be enjoyable and successful for students to learn. The motif and emotions are closely related (McDougall, 1908). Usually, motivated behaviour follows an emotion. For instance, if someone keeps giving emotional thrill returns, someone will strive to avoid or avoid being around if the return is unpleasant. The "expectancy-value" motivation model may serve as the foundation for self-motivated in emotional intelligence. The hope is one of the three elements of motivation.

Students' social issues and emotions, particularly their inability to use social skills to request support from teachers, can be linked to low academic achievement (MacMullin, 1994).

According to Scott-Jones and Clark (1986), many people's academic success is dependent on each person's goals and talents. Gaining interpersonal skills is crucial to achieving learning excellence because the social context in which learning takes place has the power to reinforce or undermine behaviours that lead to success. As social skills are crucial for academic performance, some social skills including focus, work ethic, and obedience to teachers' instructions should be researched (Cartledge and Milburn, 1978).

A wide range of social skills are essential for academic achievement in school. Students that are socially adept typically outperform their peers in school in terms of academic performance.

Pupils that struggle with interpersonal skills encounter challenges in their relationships with peers, who frequently exhibit negative behaviour, which ultimately results in subpar academic performance (Sulzer-Azaraff and Mayer, 1986). Professor of psychology Stephen N. Elliott of University Wisconsin observed that students engaged in social skills classes between 1996 and 1997 demonstrated an improvement in social skills, which in turn led to an improvement in academic achievement. According to his research, social skills and academic success are related (Sadowski, 1998).

According to Oyinloye (2005), kids in secondary schools that struggle academically often have low emotional intelligence. According to him, "pupils who lack emotional intellect exhibit some difficulties adjusting or, in some cases, struggle to meet the demands of academic work. It might be argued that these students have little to no emotional intelligence and are unable to meet personal objectives, such as achieving high academic standards. The development of emotional domains and other personal factors that contribute to students' success cannot be ignored or neglected by schools, as it is evident that the main focus of education is academic performance as measured by traditional intelligence tests or other forms of standardised examination (Nelson and Low, 2003).

The qualitative, holistic, emotional, and subjective experiences of Nelson and Low (2005) revealed the necessity for more efficient emotional intelligence skill development. Healthy development and growth depend on pupils. Students' emotional growth doesn't seem to matter unless their behaviour escalates and is brought to attention. Typical instances include poor performance, harassment, attrition, aggression in schools, drug misuse, demotivation, and psychoeducational issues. Despite the caring nature of educators, targeted assistance is frequently lacking, inefficient, or provided too late. In order to stop hazardous actions before they start and to stop reacting to them after the fact, proactive courses to recognise and develop emotional skills are required. Taking into consideration the assertions made by Nelson and Low that emotional intelligence explains a greater portion of students' extraordinary accomplishments.

2.8 ENHANCING STUDENTS PROBLEM SOLVING SKILLS THROUGH CONTEXT-BASED LEARNING

Since emotional intelligence encompasses abilities like drive and willpower, it can be crucial in reaching objectives and succeeding in a variety of spheres of life. Research carried out in research from a variety of fields, including education, health, and the workplace, suggests that emotional intelligence is linked to several facets of success in life. For instance, Fernandes and Rego (2004) discovered that students' academic success, health, and life happiness are significantly correlated with their EI. According to a study by Carmeli and colleagues, there is a substantial correlation between senior managers' emotional intelligence and their work attitudes, behaviours, results, and job

satisfaction. Executives with strong emotional intelligence perform better at work, according to Khokhar and Kush's (2009) research.

Abdul-Azib (2006) discovered a strong inverse connection between 73 Malaysian university professors' workplace deviant behaviour and their emotional intelligence. Malouff, Schutte, and Schuettpelz (2000) discovered a link between emotional intelligence and cognitive task performance. According to a 2007 study by Qualter, Whiteley, Hutchinson, and Pope, pupils who possess more emotional intelligence are better equipped to handle the change from elementary to secondary education.

When kids understand how to learn, they can learn effectively, and this understanding necessitates certain emotional skills. self-assurance, self-control, and communication skills as well as the capacity for teamwork. Numerous researches have revealed a favourable relationship between academic success and emotional intelligence. The results of Fannin's (2002) study demonstrated a favourable relationship between achievement scores and emotional intelligence. A correlation between academic achievement and emotional intelligence was discovered by Marquez, Martin, and Brackett (2006). Researchers Rozell, Pettijohn, and Parker (2002) discovered a connection between Mid-Western University undergraduate students' CGPA and emotional intelligence.

The importance of emotional intelligence was highlighted by Nelson and Low's (2004) study when high school graduates were adjusting to their first year of college. They highlighted the significance of emotional intelligence abilities as determining factors in student retention and achievement. Hogan, Parker, and Sommerfeld & Majeski (2004) discovered that throughout the transition phase, emotional intelligence was a predictor in identifying kids who would succeed academically and those who would fail. Interpersonal, stress management, and adaptability BarOn EQi measures were found to be significant predictors of first-year university students' academic achievement in a study by Jaeger and Eagan (2007). Additionally, Abdullah (2006) discovered that a few aspects of emotional intelligence strongly predict college students' academic success. After examining studies on the connection between emotional intelligence and higher education

In Pakistan, studies have been carried out to investigate the connection between emotional intelligence and various facets of life, such as educational and professional environments. Zafar discovered a association between emotional intelligence (EI) and university teachers' self-efficacy; Kiani (2003) investigated the relationship between EI and workplace conflict management; and Aslam (2004) discovered a relationship between information technology professionals' EI and occupational stress. When Farooq (2003) looked studied how 246 teenage students' academic performance was affected by their emotional intelligence, she discovered that students with strong emotional intelligence outperform those with poor emotional intelligence.

Psycho-educational research has shown a correlation between gender differences in emotional intelligence and emotional intelligence, but this relationship has not been thoroughly established. constituted. Certain research findings suggest notable variations in emotional intelligence between genders, but other findings challenge this assumption. It seems from popular literature that there are considerable differences between the emotional intelligence styles of men and women. In general, people believe that women and girls are more sensitive to emotions and caring than males and boys (Eisenberg, 1994). However, Goleman (1998) refutes the notion that emotional intelligence is higher in men than in women and vice versa. According to BarOn (1997), there aren't any though there may not be a gender gap in overall emotional intelligence, there may be in certain emotional domains.

There was a notable disparity between the emotional intelligence scores of males and females in the 200 participants in the study by Harrod and Scheer (2005), with the females reporting greater EI level. Females with higher EI ratings were found in the Chandighar adolescent study by Katyal and Awasthi (2005); however, the difference was not statistically significant enough to be conclusive, simply indicative of a trend. In their investigation into the connection between emotional intelligence and transformational leadership style, Mandell and Pherwani (2003) discovered a statistically significant difference in the EI ratings of male and female managers. Adeyemo (2008) discovered that female employees in various organisations exhibited notably greater emotional intelligence compared to their male colleagues. Other

research found that there are gender variations in a few emotional intelligence domains.

More social and emotional intelligence results from an increase in cognitive abilities with ageing (BarOn, 2006); nevertheless, research in this field indicates that there is minimal variation in emotional age-related intelligence. For instance, a study on the differences in the EI levels between Turkish scouts and scouts from other nations based on age and gender was carried out by Balci-Celik and Deniz (2008). Researchers did not find significant differences in emotional intelligence across genders or between age groups. Additionally, Birks, McKendree, and Watt (2009) did not discover a statistically significant relationship between the emotional intelligence of healthcare students and their age. However, a study conducted in 2006 by Fariselli, Ghini, and Freedman looked at the connection between age and emotional intelligence and found a small but substantial positive correlation (r= .135).

These findings suggest that there might be a connection between academic success and emotional intelligence.Also, a person's age and gender may have a significant role in the development of their EI. individual. With the aforementioned considerations in mind, the purpose of this study was to investigate the connection between the academic success and emotional intelligence of International Islamic University Islamabad (IIUI) students. Furthermore, studies have looked at the connection between emotional intelligence and age and gender. According to the study, there is no discernible difference in emotional intelligence between gender and age, and emotional intelligence is a strong predictor of academic success.

There has been conflicting evidence in the past on the connection between academic success and creativity. According to certain studies, creativity and academic performance are favourably correlated. academic achievement (Runco, 2007; Asha, 2011; Murphy, 1973), however other studies (Rampaul et al., 1984; Knox & Glover, 1978; Crawford & Nirmal, 1976; Aliotti et al. (1975)) indicate that creativity and academic achievement are not associated or are adversely correlated. The goal of the study is to investigate the connection between academic achievement and creative styles in elementary and middle school children. Students' academic progress is determined by their scores on standardised tests in the subjects of math, science,

social studies, physics, and Chinese, their native language; their creative potential is determined by the Torrance Tests of Creative Thinking-Figural (Torrance, 1966).

TTCT and additional creativity tests Similar findings from studies utilising creativity tests indicated that academic achievement and creativity were strongly correlated (Murphy, 1973; Asha, 2011). Investigate using There was minimal correlation between the Villa and Auzmendi and Abedi-Schumacher creativity tests (Ai, 1999). According to Erdoğan et al. (2008), research employing the KAI Creativity Scale revealed a negative correlation. Additionally, studies employing the Barron-Welsh Art Scale discovered an inverse correlation (Furnham et al, 2006). Results from studies that used the TTCT to measure creativity were not very conclusive. Overall academic accomplishment is generally unrelated to the total score obtained from either the verbal or figural component of the TTCT (Ai, 1999; Kim & Michel, 1995; Rampaul et al., 1984; Knox & Glover, 1978; Crawford & Nirmal, 1976). Nevertheless, several subscales associated with particular subjects have been identified.

2.9 THE EFFECT OF CONCEPT MAPPING ON CLINICAL DECISION MAKING SKILLS OF STUDENTS

Students at secondary schools who participated in the research produced a variety of results. Several research (Asha, 2011; Marjoribanks, 2011; Murphy, 1973) discovered a noteworthy correlation.Others (Ai, 1999; Kim and Michel, 1995; Crawford & Nirmal, 1976; Aliotti et al, 1975) discovered no link or a negative one. With the exception of one study (Rampaul et al., 1984) that revealed no association at all or a negative relationship, most studies including elementary school pupils found a strong relationship between academic achievement and creativity. Despite the possibility that their findings show various subjects correlate with various scales. Brady et al. (1999) discovered a correlation between the academic scores of their participants and better scores on the TTCT's atypical uses test and flexibility subscale. According to Kaltsounis & Stephens (1973), there is little association between the nonverbal creativity test and the verbal creativity test's originality scale, however there is a substantial.

It seems from the literature study that opinions on the connection between academic success and creativity are divided. The conflicting findings of research on the relationship could show that disparities in academic achievement according to age, gender, and subject matter are present, but all of the findings eventually imply that these variations account for various creative approaches. But less Studies looked at the connection between creative styles and academic success. Kirton (1976) distinguished between two dimensions of creative problem solving: innovative and adaptive preferences. Jablokow and Kirton's (2009) research indicates that the main distinction between innovators and adaptors is how they handle change: Though innovators often completely alter the existing state of affairs, adaptors make every effort to raise things to a higher standard.

On the topic of creativity, a great deal of recent study has been done (Charlton, 2009; Heinze, Shapira, Rogers, & Senker, 2009; Ivcevic, 2009; Miller, 2007; Runco, 2007a, 2007b; Simonton & The relationship between academic achievement and creativity (Ai, 1999; Coyle & Pillow, 2008; Palaniappan, 2005; Palaniappan, 2007a; Steinmayr & Spinath, 2009), academic achievement and gender (Barkatsas, Kasimatis, & Gialamas, 2009; Hosenfeld, Köller, & James, 2007; Yusuf, 2009), and academic achievement in relation to creativity as well as gender and creativity (Ai, 1999; Habibollah et al., 2008; Naderi et al., 2008; Palaniappan, 2000, 2007a). Baumert, 1999; Penner & Paret, 2008). One study found little evidence of a correlation between academic achievement and creativity (Ai, 1999).

In his study of risk-taking conduct in connection to cognitive and noncognitive traits, Sharma (1989) discovered that (i) pupils with lower risk-taking behaviour are smarter than those with higher risk-taking behaviour. (ii) the degree to which risk-taking behaviour and intelligence interact to partially offset the impact of creativity is found to be moderate in female students and negligible in male students, and (iii) the degree to which male and female students interact to partially offset the impact of intelligence is found to be moderate.

Kohler (1996) investigated the relationship between risk-taking behaviour and critical thinking abilities in a sample of one hundred teenagers. A correlation coefficient of 0.29 was discovered between risk-taking behaviour and the data analysis and locus of

control, as well as critical thinking. It also indicates that men are more likely than women to take risks.

Saran (2003) carried out a study to compare the risk-taking behaviour of tenth class students in the higher/senior secondary schools of the Ludhiana district and to determine the association between risk-taking behaviour and IQ. There were 219 students in the final sample. The study found that while average intelligence is more risk-taking than high and low intelligence, there is no statistically significant relationship between risk-taking and intelligence.

Erasmus (2007) investigated how teenage boys' adaptability in private schools was influenced by their emotional intelligence. The findings demonstrated a correlation between a lower emotional quotient and higher rates of alcoholism, smoking, and social deviance. Additionally, it demonstrated a clear connection between risk-taking conduct and emotional intelligence. Adolescent boys aged 14 to 18 who exhibit problematic behaviour may be lacking in emotional intelligence. Adolescent guys with giftedness who struggle with emotional issues are prone to self-destruction and reckless activity.

Using a sample of 162 respondents, Hamid et al. (2013) investigated the relationship between risk propensity, risk perception, and risk-taking behaviour in an emerging market. The findings showed a negative connection between a person's perception of risk and their actions. The greater the perception of risk, the lower the likelihood of taking risks.

2.10 IN THE EARLY CHILDHOOD PERIOD CHILDRENS DECISION MAKING PROCESS

Joshi (2013) investigated the relationship between 200 students enrolled in senior secondary classes in Palampur city's risk-taking conduct and emotional intelligence. The study's findings indicate that Teenagers' propensity for taking risks and their emotional intelligence are positively correlated. That outcome is contradicted by boys being as girls. The findings also indicate that whereas average and low emotionally intelligent pupils do not exhibit any risk-taking behaviour in the classroom, students with high emotional intelligence do.

Rivers et al. (2013) looked into emotion intelligence among college students as a potential deterrent to risky behaviour. College students' psychological development is thought to be reflected in their involvement in health-endangering behaviours, albeit not all of them engage in these actions. Emotional intelligence, or the capacity to recognise and control one's emotions, may operate as a deterrent to risk-taking among developing adults. The study contrasted the effects of self-esteem, a risk factor that is frequently researched, and emotional intelligence on undergraduates' propensity for taking risks. Risky behaviours were substantially correlated with emotional intelligence, but not with self-esteem, according to structural equation modelling.

In 2015, Cheung and colleagues conducted research on the correlations between emotional intelligence, sensation-seeking, and risk-taking behaviours among Hong Kong university students. The study's findings demonstrated that for the use of emotion and emotion control in this group of Chinese university students could be a strong predictor of their desire for exciting activities. The findings indicated a strong correlation between risk-taking and emotional intelligence. More precisely, pursuing interesting activities was influenced by the usage and regulation of emotions.

Pankove (1967) investigated the link between creativity and risk-taking in a fifth-grade class of 84 males and 78 girls. Two tests were used to gauge creativity: the alternate uses (verbal) and patterns with visual implications. Three tests were used to gauge risk-taking. The study's key findings indicate that girls did not significantly benefit from the favourable association between creativity and risk-taking that was observed in males, but that girls did benefit from it in combination with intellect. However, creativity had a little bigger impact. The author came to the conclusion that taking risks is more strongly correlated with creativity than with IQ.

Guilford (1968) lists a few particular motivations that he believes are connected to creativity. These include an exceptionally high level of curiosity, a craving for adventure, a readiness to take chances, a tolerance for uncertainty, and a strong need to for independence and self-direction, the need for validation of his achievements from others, a high degree of self-sufficiency, and assertiveness.

Pankove and Kogan (1968) studied elementary school students' capacity for creativity and willingness to take risks. He investigated the connections between a few metrics of creativity, IQ, and risk-taking in a an example of fifth graders. For boys, a substantial correlation was found between their preferred degree of risk-taking on a shuffleboard exercise and the number of associates they formed for creative tasks given in game-like settings. An I.Q. indicator that had nothing to do with creativity revealed a slender correlation with taking risks. The creative risk-taking relationship's interpretation suggested that self-confidence might be a mediating factor.

Torrance (1968) listed 84 traits of a creative person's personality. These included being risk-takers, daring, and willing to tackle challenging tasks. Additionally, according to Raina, a creative person is willing to take chances. He's not at all concerned about criticism, disagreement, or even persecution.

2.11 ENHANCING STUDENTS COMMUNICATION SKILLS THROUGH PROBLEM POSING AND PRESENTATION

Jose (1970) investigated the connection between taking risks and divergent and convergent thought processes. 200 Filipino males in the sixth grade, ages 11 to 13, made up the sample. The outcomes showed that there is no meaningful connection between taking risks and using diverse thinking. The anxiety and divergent thinking were revealed to be strongly negatively correlated. contemplating. There is no discernible connection between taking risks and divergent thinking. However, the findings also demonstrated a statistically significant positive correlation between taking risks and convergent thinking.

Irene (1971) studied the connection between fifth graders' academic risk-taking and creativity. Analysis of variance revealed that there was no meaningful connection between taking risks and linguistic skills or sexuality. Boys were noted to take more risks than girls, nevertheless. It was discovered that among fifth grade boys and girls as well as the entire sample, there was no significant correlation between the ability to think creatively and taking academic risks. The findings were consistent for the total creativity score as well as for the four creativity factors examined: originality, fluency, adaptability, and elaboration.

Rudder (1972) looked at the connection between various forms of risk-taking and semantic divergent thinking in fifth grade students. The arrangement of connections

between several types of risk-taking behaviour as well as the variables of IQ, sex, achievement-drivenness, and divergent thinking styles. There was a chance game and an academic risk in the risk scenarios, and there was a strong negative correlation between it and remote and flexible divergence. IQ explained 13% of the variance in academic risk-taking, the dependent variable. None of the factors examined had any statistically significant correlations with taking risks in a game of chance.

Ritchie (1981) looked into the correlation between boys' and girls' I.Q., creativity, and willingness to take risks in kindergarten through third grade in Piedmont, North Carolina. The information was gathered via The Slosson Intelligence Test, the subjects' self-assessment of taking risks (PACT), and teacher judgement (Renzulli-Hartman Scale of Creativity). The results of the data analysis indicated a positive correlation between the intellectual quotient and instructors' ratings of creativity. The subjects' self-assessment of their willingness to take risks and the teachers' evaluation of their inventiveness in connection to IQ did not correlate. It was discovered that teachers had a bias in favour of women during the selection process. The study came to the conclusion that, unless teachers place a high priority on creativity, subjects' attitudes towards taking risks were a better way to gauge young children's creative qualities than teachers' assessments.

In a study conducted in 1983, Thandani examined the relationship between creativity and risk-taking behaviour in sixth-grade students enrolled in secondary and higher secondary schools located in several regions of Rajasthan. The information was gathered using the assistance Test of Verbal and Nonverbal Creativity by Baquer Mehdi and Test of Risk-Taking Attitude by Raizeda. The study's findings demonstrated that there was no discernible correlation between risk-taking behaviour and the verbal measures of creativity's fluency, flexibility, and originality, or the nonverbal measures' elaboration.

Bhawalkar (1992) looked into high school pupils' scientific creativity. elements like self-assurance uncertainty tolerance, taking calculated risks, independence, intellect, scientific mindset, and academic motivation and academic success in science and math predicted creativity. Highly creative people tend to be more kind, perceptive,

emotionally secure, energetic, passionate, and self-controlled. The findings showed that people who take big risks also tend to be very creative scientists.

Robsman (1992) designed a study focusing on kindergarten through fifth grade at-risk pupils. This study had two goals: first, it looked at creative ability as described by teachers and the Torrance at-risk students take the Figural Form B Test of Creative Thinking in order to gauge teachers' comprehension of Torrance's definition of creativity and the connection between their expertise and students' outcomes. Results from the Torrance test revealed that teachers most frequently cited curiosity as their they gave flexibility and imagination high ratings, but their least creative students sometimes lacked the courage to take risks.

Kaur (2002) investigated schoolchildren's risk-taking behaviour and inventiveness. It was discovered that there is a strong correlation between risk-taking behaviour and fluency, adaptability, and total creativity. But not a noteworthy correlation was observed between the "originality" aspect of creativity and the willingness to take risks. The inquiry went on to clarify that there are notable variations in the creative potential of student groups exhibiting high or low levels of risk-taking conduct. The study unequivocally shows that risk-taking conduct has an impact on creativity.

Kaur (2002) investigated schoolchildren's risk-taking behaviour and inventiveness. It was discovered that there is a strong correlation between risk-taking behaviour and fluency, adaptability, and total creativity. But not a noteworthy correlation was observed between the "originality" aspect of creativity and the willingness to take risks. The inquiry went on to clarify that there are notable variations in the creative potential of student groups exhibiting high or low levels of risk-taking conduct. The study unequivocally shows that risk-taking conduct has an impact on creativity. Alawad (2012) looked on how risk-taking behaviour among students in Jeddah, Saudi Arabia, aged 12 to 15 affected their capacity for critical and creative thought. To guarantee equal student Wadhwani and Gour (2014) investigated the relationship between managerial creativity and risk-taking behaviour and study discipline in 288 science and management students in higher education who were older than 22. & Education Disciplines, as well as being affiliated with Indore-based

institutions and university teaching departments. The findings showed that, while managerial creativity was found to be independent of risk-taking, study discipline was found to have a substantial impact on managerial creativity. Additionally, there was an interaction between study discipline and risk-taking behavior. The outcome additionally demonstrated that the compared to education and science students, management students were shown to have much greater levels of managerial innovation. It was discovered that taking risks both alone and in conjunction with the field of research had no discernible impact on the managerial creativity

The relationship between personality qualities, motivation, academic risk-taking, and metacognition and mathematical creativity was examined by Erbas and Bas (2015). The findings demonstrated that while receptivity to new experiences and extraversion, agreeableness, and neuroticism did not correspond with the creativity scores, however consciousness did strongly correlate with mathematical creative abilities. Furthermore, the most important predictor of mathematical creativity was intrinsic goal orientation, which was followed by openness to experience. Creative ability and academic risk-taking were not strongly associated. Mathematical creativity was not predicted by cognition regulation or knowledge, despite the latter two having very modest associations with the former.

The internal/external locus of control, self-esteem, and linguistic interactions between parents and at-risk male adolescents were examined by Enger et al. (1993). The association between locus of control and self-esteem was shown to be moderately negative, which was different from the earlier conclusion that there was no significant relationship for teenagers. It seems that the male teenagers who are at risk and who believe more taking accountability for their experiences makes individuals feel better about themselves. Students with greater internal control scores generally got more encouraging verbal communication from their parents, whereas those with higher external control scores generally got more unfavorable verbal communication. Furthermore, compared to pupils with lower self-esteem, those with greater self-esteem thought their parents communicated with them more positively. Ogunyemi and Mabekoje (2007) conducted research to ascertain the relative and combined effectiveness of risk-taking and self-efficacy.

The relationship between self-efficacy, taking risks, and performance in rock climbing was examined by Llewellyn et al. (2008). The findings showed that climbers with high levels of self-efficacy participate in high- and medium-risk rock climbing more regularly and at a harder difficulty level. Climbers hired for both indoor and there were no appreciable differences in age, sex, self-efficacy, experience level, or involvement in high-risk climbing among outdoor climbing locations. There were two positive significant relationships, two non-significant associations, and one negative significant association found in the complex relationship between age and the frequency of climbing behaviors. The frequency, difficulty, and experience of all climbing activities were positively and significantly correlated with self-efficacy.

The primary and combined impacts of affective responses and information sufficiency on trust in oneself and responsible agencies were examined by Huurne and Gutteling (2009). Self-efficacy and institutional trust are related were discovered to influence risk information needs and choices, as well as emotional risk responses. The study's findings show a significant correlation between perceived personal control and institutional trust. Given that there were no interaction effects between institutional trust and self-efficacy in terms of predicting the dependent variables, the hypothesis that self-efficacy and institutional trust are counterparts may hold true in this situation. While risk information sufficiency and affective reactions were strongly correlated with both self-efficacy and institutional trust, self-efficacy was highly correlated with both dependent variables.

2.12 PROBLEMATIC INTERNET USE AND SOCIAL COGNITIVE FACTORS AMONG STUDENTS

Sharma (2009) discovered a weak but substantial correlation between athletes' self-concept and their willingness to take risks. It suggests that athletes would take greater risks if they had a more positive self-image actions. Because they had greater self-confidence, they were more willing to take up risky situations and manage hazards when playing sports. Conversely, athletes who score lower on self-concept are less likely to take chances in their behaviour. They are afraid of dangerous situations and are not as capable of choosing or controlling risky behaviour.

Odac (2012) examined whether problematic internet use differs among teenage university students and the relationship between risk-taking behaviour, academic self-

efficacy, and problematic internet use based on the factors of living with the family, having a computer, and gender. 556 students from Turkey's Fatih Faculty of Education at Karadeniz Technical University make up the sample. The findings indicated that problematic internet use differs by gender, with men rating higher than women. The findings showed that children who scored highly on the problematic internet use scale were computer owners. Students who had laptops scored higher than those who did not when it came to problematic internet use. This result could suggest that having a computer means having the freedom to grant university students unrestricted access to the internet.

Shaheen et al. (2013) looked into the relationship between personality traits, mental health, and self-efficacy among college students at Aligarh Muslim University in Aligarh, India. The findings showed that only the extraversion, agreeableness, conscientiousness, neuroticism, and openness dimensions of the NEO and FFI showed a strong positive correlation with improved mental health in students. Additionally, there was a substantial positive correlation between self-efficacy and conscientiousness and extroversion, and a negative correlation with neuroticism. Furthermore, a positive correlation between self-efficacy and mental health was discovered.

The study conducted by Jabran et al. (2014) aimed to investigate the joint impact of risk-taking behaviour and self-efficacy on the personal growth initiative of university students at Mohammad Ali Jinnah University Islamabad. The descriptive analyses show that most students gave higher scores for self-efficacy and initiative for personal development. On the other hand, the response about taking risks indicates a poor score. Self-efficacy and risk-taking behaviour have a positive link with the criteria variable, according to the correlation analysis. The findings show that risk-taking behaviour and self-efficacy in personal growth initiatives account for 18% of positive changes. According to the analysis, risk-taking behaviour and self-efficacy both contribute to self-efficacy.

Smorti (2014) examined the relationship between self-efficacy and sensation seeking in relation to three health risk behaviours in teenagers: driving recklessly, drinking

alcohol, and using marijuana. The study included 330 Italian teenagers. The adolescents with high levels of sensation seeking and low levels of self-efficacy exhibited statistically higher health risk behaviours, while the adolescents with low levels of sensation seeking and strong self-efficacy exhibited the lowest levels of these behaviours. The findings suggest that whereas low sensation seeking and high self-efficacy are protective factors against health problems, high sensation seeking and low self-efficacy are probably risk factors for health in teenagers. While high sensation seeking and low self-efficacy together form a significant risk factor for health risk behaviours, high self-efficacy is a substantial protective factor against engaging in these behaviours.

Atkinson (1957) provided an explanation of a model that postulates the strength of motivation as a multiplicative function of motive, expectation, and incentive. The model explains how the goal to succeed and the motive to avoid impact failure behaviour. In addition to assuming that the incentive value of success is a positive linear function of difficulty as deduced from the subjective probability of success, this also accounts for aspiration level and performance level when only one task is presented. It also assumes that the incentive value of failure is a negative function of difficulty. When there is the most uncertainty about the result, performance should be at its highest. Those who are very motivated to succeed should take immediate risks, while those who are highly motivated to avoid failing will choose simple or incredibly tough assignments.

A theoretical model was put forth by Atkinson (1958) to explain how conduct is influenced by the desire to avoid failure in any circumstance where performance is measured against an ideal. An understanding of what drives wherein incentive is provided to account for the choice of one task among alternatives that differ in difficulty (Level of aspiration) and to account for performance level when only one task is presented. The strength of motivation is a joint multiplicative function of motive, expectation (Subjective probability), and incentive. The incentive value of success is thought to have a positive linear negative incentive value of failure is considered to be a negative linear function of difficulty, as deduced from the subjective likelihood of success. The theory's principal ramifications Morris (1966) investigated how a person's inclination for taking risks influences their choice of

career. One hundred and forty-four male high school seniors were asked to select an occupation from ten lists. Every list served as an example of a jobs in the Kuder vocational interest category ranged from extremely simple to quite complex. Selections were made in the categories where participants' scores indicated which were most and least likely to succeed. The group was divided based on achievement motivation, and it was demonstrated that each section's career decisions supported the underlying risk-taking paradigm. People with high achievement-related drive behave as though they were taking on a moderate level of danger. Individuals with low achievement-related motivation made the decision to.

Richard and Dave (1965) tested the hypothesis that participants with hope of success will be more successful at shooting a volleyball by studying risk-taking behaviour in 71 elementary school boys. subjects who have hope of success will take more modest risks than subjects who have fear of failure, and subjects who have fear of failure will put more money into a basket. There were no connections discovered between the measurements and taking risks. However, it was discovered that subjects with high hope of success and high fear of failure shot more successfully in the 70 practice trails and took more moderate risks in the 20 free choice trails than did the other subjects, according to the Jorden-Decharms method of assessing achievement orientations.

The J.W. Atkinson risk taking model, which involved a link between the eight measures of need for achievement (nAch) and the twelve variables of risk preferences, was empirically evaluated by Weinstein (1969). Actions. Over the course of four work periods, 198 male undergraduate students were given a battery of tests. The results of the data analysis showed that: (i) there was little to no correlation between the n-Ach measures; (ii) traditional n-Ach measures had very poor reliability (both in terms of internal consistency and test-retest reliability); (iii) there was little convergence of risk preferences across different contexts; and (iv) the Atkinson model was only confirmed for risk preferences related to career choices. The multidimensional nature of both the nAch and risk-preferences measures was demonstrated by factor analysis.

The importance of attribution processes in achievement behaviour was elucidated by Touhey and Villemez (1975). Replication and analysis of the effects of self-rated task ability and effort- or ability-inducing task instructions were conducted. Expansion of earlier research on the desire for achievement and inclination for taking risks. It was discovered that subjects with lower task ability consistently chose more intermediate risks than subjects with higher ability, regardless of need achievement. Additionally, it was discovered that whereas ability instructions moderated differences among high-need achievers, effort instructions moderated differences among high-need achievers.

Small-scale industrial entrepreneurs' risk-taking and accomplishment motivation were investigated by Singh and Jaiswal (1977). The risk-taking strategies and achievement motivation of fifty-four small-scale industrial entrepreneurs of Punjab were connected to their industry' rates of growth. Low achievement motivation and high risk-taking were linked to falling business, while high achievement motivation and moderate risk-taking were linked to business success.

2.13 NEURAL CORRELATES OF SOCIAL COGNITION IN STUDENT POPULATIONS

Das (1988) investigated the motivational factors influencing the risk-taking behaviour of adolescents, both disadvantaged and not, using 400 female students as subjects. The study's findings demonstrate that the group of people from low socioeconomic class had emotional, financial, physical, and were also rejected, and both groups displayed a craving for connection and authority, as well as a willingness to take risks; nevertheless, the disadvantaged group scored higher overall.

Saha (1991) looked into the factors that motivate people to take risks. The sample consists of 300 male undergraduates from Magadh University in Bodh Gaya, Bihar, who are based in cities. The age range of the participants was 18 to 22 years. The findings showed that there was a substantial difference in achievement motivation between the high, moderate, and low risk taker groups. The findings also show that people with strong achievement and order motives are low risk takers. It has been discovered that the motivations for efficiency, display, introduction, securance, dominance, nurturing, change, endurance, heterosexuality, and aggression are distinct from risk-taking conduct.

Martin and Leary (2001) looked at how teenagers used risky and hazardous activities to improve how they presented themselves. When 110 students began their first semester of college, they filled out trait measures of worry for one's appearance. They were questioned about their usage of health-risky practices as impression-management strategies at the end of the semester. Seventy-five percent of participants said they had engaged in at least one dangerous conduct in their first semester of college for reasons related to how they promote themselves. The most prevalent habits were driving carelessly, smoking, drinking, and pulling out risky acts. The need to be seen as "cool" or a "risk-taker" frequently led to unhealthy choices. Self-presentational motives may occasionally influence teenage health risk activity, according to modest correlations found between the trait scores and health risk behaviours.

Laskey (2004) looked researched the personality and motivational elements that have an impact on at-risk college students' retention and academic success in both positive and negative ways. It was discovered that metacognition, self-efficacy, and the consciousness is a crucial personality feature that affects at-risk college students' retention and academic success. In order to support at-risk students in their efforts to succeed academically, universities that admit them must set up appropriate interventions and programmes.

Tang and Tang (2007) investigated how risk-taking inclination and accomplishment motivation relate to new venture performance. Panel Study of Entrepreneurial Dynamics (PSED) data were utilised in the study to test the theories. The study's findings indicate a strong positive association between achievement motivation, risk-taking, and performance. Performance and inclination to take risks were strongly connected with achievement motivation. There was a negative association between performance and the inclination to take risks.

Yan (2010) looked at the relationship between 207 respondents' perceptions of fresh business opportunities and their entrepreneurial personality qualities. Multiple regression analysis results indicate that three of the four Three characteristics of an entrepreneurial personality—locus of control, tendency for taking risks, and

proactivity—have a strong and predicted relationship with the perception of new venture opportunities. It was discovered that proactivity, out of the three personality traits, had the biggest impact on the view of entrepreneurship. The impression of a fresh enterprise possibility and achievement motivation did not appear to be significantly correlated. Only work experience, out of the six control factors, was found to have an impact on how people perceived new venture opportunities.

A descriptive, qualitative study by Paunescu and Cantaragice (2012) was designed to evaluate a hypothesis on the psychological characteristics of medium and senior managers as well as entrepreneurs in Romania. The intention behind the purpose of the study is to characterise and test the theoretical model put forth for the relationship between need achievement and risk-taking in a business context using data collected from Romanian businesspeople. 137 Romanian businesspeople with managerial experience who satisfied at least one of the following sampling requirements made up the sample. (i) the creator or current owner of a business in Romania; (ii) presently holding a top management role; or (iii) presently holding a managerial position. The study's conclusions show that taking the inclination into consideration is quite beneficial.

2.14 SOCIAL COGNITIVE AND AFFECTIVE NEUROSCIENCE: INSIGHTS INTO EMOTIONAL PROCESSES

Decharms and Dave (1965) investigated the risk-taking behaviour, subjective likelihood, hope of success, and fear of failure in 71 elementary school boys from a big Midwestern city. The participants with great expectations of achievement and less fear of failing exhibit a pattern a lot like individuals who have a low expectation of success and a great fear of failing. More than any other group, they frequently emphasise the extremely high danger, yet they also have a minor mode with a 0.60 success probability. The current study's findings appear to suggest that there is no relationship between overall achievement and the degree of probability of success when these factors are considered independently and objectively evaluated before being presented with risk-taking situations.

The willingness to take risks and the ability to persevere through tasks under various reinforcement-success scenarios were examined by Martin and Richard (1968).It was

suggested to undergraduates to take part in one or two experiments. In the initial trial, they were paid right away for their labour.In the second trial, the subject's odds of receiving sixty dollars were 1/60. Subjects were free to stop at any time after the first ten judgements. It was discovered that participants at both high and low risk exhibited more persistence at the intermediate than at the high or low success levels. This tendency was particularly noticeable when high-risk individuals were involved.

The following personality traits were found to be associated with school readiness in a study by Flynn (1975), specifically in relation to 195 preschool-aged migrant children from Florida. The following traits were looked at: risk-taking, delay of pleasure, association with accomplishment model, dependence, motor inhibition, self-control, and self-concept. A cognitive ability test was employed as a covariate to eliminate accomplishment variance caused by the child's cognitive capacity in order to guarantee that the features studied were of an effective nature. The findings showed that risk-taking was associated with school readiness for both boys and girls; self-concept, delay of gratification, and motor inhibition accounted for a significant percentage of variance for boys but not for girls.

Research by Morris and Lynn (1978) looked at the connection between community college students' age and willingness to take risks. All responses to "nonsense" items were expected to be an a sign of a risk-taking attitude. The co-relational results showed that age and sex did not account for a significant amount of the variance in linear risk taking, although revealed age distinction was related to a moderate amount of nonlinear variance. The results of the comparison indicated that risk scores were greater for high school students than for mature adults, who in turn were higher than for young and middle-aged adults. This suggests that there may be a nonlinear age function for taking risks from the second to the seventh decade of life.

On 150 post-graduate students, Roy and Chaudhary (1987) investigated the connection between risk-taking behaviour and personality maturity. The study's findings showed a correlation between high personality maturity and Moderate risk-taking was linked to both middle and low personality maturity, but high risk-taking was connected with both. Individuals in the high and positive personality maturity

groups respond to situations based on their prior experiences, while the majority of subjects in the high personality maturity group preferred to take moderate risks. Subjects in the moderate and low personality maturity groups preferred to take high risks. They did not begin any line of action until they had determined the probability of the outcome. This maturity results in delayed decision-making and reduced risk-taking.

According to Irwin & Millstein (1993), environmental and biopsychosocial factors play a role in risk-taking. High sensation seeking inclination, predisposing circumstances lead to dangerous decisions and conduct that mostly rely on the social and cultural context in which the decision is made. Risk-taking behaviour is predicted by a number of factors, including developmental propensity for risk-taking, impulsivity, egocentrism, aggression, cognitive biases, lack of knowledge of consequences, gender (males are more likely to engage in risky behaviour), age, hormonal effects, biological motivation, self-esteem, school and school transitions, race and ethnicity, socioeconomic status, parenting style towards peers, and community behaviours.

Among a 1993 study, Richardson et al. investigated the association between parental supervision and harmful behaviours among ninety-nine ninth-grade students from six Southern California school districts. These behaviours included risk-taking, depression, and the use of alcohol, cigarettes, and marijuana. Teens who were not under supervision at home had a somewhat higher likelihood of participating in problem conduct compared to those who were. Teenagers at a work, school, or neighbor's residence, and particularly those who "hang out" were more likely to act in a problematic manner. A parent's uninvolved parenting approach increased risk. Girls were far more likely to experience each of these issues as supervision dropped, despite the fact that they were less likely than males to participate in harmful behaviour when under supervision. Johnson and Powell (1994) looked at risk-taking and decision-making behaviours, as well as how decisions made by men and women differed in kind. In business, women are becoming more and more significant.

The ability of management and managers to make decisions is how they are eventually assessed and tested. As such, disparities in the disposition and calibre of

judgements made by male and female managers will have a significant impact on the organisations in which they operate. A "managerial" population of potential and current managers who have completed formal management education is compared with the decision-making traits of men and women in a "non-managerial" population, where the majority of people have not had such education. There is a claim that women are frequently left out of leadership and managerial roles.

In order to comprehend how social and emotional processes are represented in the brain, the multidisciplinary discipline of social cognitive and affective neuroscience (SCAN) integrates concepts from cognitive science, psychology, and neuroscience. These procedures are essential for students' learning, interpersonal interactions, and general wellbeing. This review summarizes studies conducted between the early 2000s and the present, emphasizing significant discoveries and theoretical advancements in SCAN with regard to student populations.

A meta-analysis by Durlak et al. (2011) found that students participating in SEL programs showed improved social and emotional skills, attitudes, behaviour, and academic performance.Research by Immordino-Yang and Damasio (2007) suggests that emotional engagement in learning enhances memory retention and understanding, as emotional experiences are processed in the same neural networks that support learning.Studies show that these abilities develop throughout childhood and adolescence, with significant changes occurring during the teenage years. For instance, Blakemore and Mills (2014) highlight the neural and cognitive changes that underpin the development of ToM during adolescence.

2.15 EFFECTS OF COGNITIVE TRAINING ON SOCIAL COGNITIVE SKILLS

Siegle, G. J., Thompson, W., Carter, C. S., Steinhauer, S. R., & Thase, M. E. (2006). "Increased amygdala and decreased dorsolateral prefrontal BOLD responses in unipolar depression: Related and independent features." *Biological Psychiatry, 61*(2), 198-209. Cognitive Behavioral Therapy (CBT) has been shown to alter neural activity patterns, particularly in the prefrontal cortex (PFC) and amygdala, regions associated with emotion regulation and executive function. Functional MRI studies indicate that CBT can enhance neuroplasticity, facilitating changes in brain circuits involved in

mood regulation. These findings suggest that CBT not only helps in symptom reduction but also brings about structural and functional changes in the brain, reinforcing its long-term efficacy.

Miller, E. K., & Cohen, J. D. (2001). "An integrative theory of prefrontal cortex function." *Annual Review of Neuroscience, 24*(1), 167-202.This seminal work outlines the role of the PFC in cognitive control, decision-making, and the integration of cognitive processes. The PFC coordinates activity across different brain regions to support complex behaviours and goal-directed actions. Understanding PFC function provides insights into various cognitive disorders, such as ADHD and schizophrenia, where these processes are disrupted.

Eichenbaum, H. (2004). "Hippocampus: Cognitive processes and neural representations that underlie declarative memory." *Neuron, 44*(1), 109-120. The hippocampus is critical for the formation and retrieval of declarative memory. It supports the encoding of new information and spatial navigation, acting as a hub for integrating sensory inputs into coherent memory traces. These insights have profound implications for understanding memory disorders like Alzheimer's disease and developing interventions to mitigate memory loss.

Schultz, W. (2002). "Getting formal with dopamine and reward." *Neuron, 36*(2), 241-263.Dopamine release in the nucleus accumbens is central to reward processing and reinforcement learning. This neural mechanism explains how rewards shape behavior and decision-making.Disruptions in this system are linked to addiction and other psychiatric conditions, highlighting targets for therapeutic intervention.

Bush, G., Luu, P., & Posner, M. I. (2000). "Cognitive and emotional influences in anterior cingulate cortex." *Trends in Cognitive Sciences, 4*(6), 215-222. The ACC is involved in monitoring conflicts, error detection, and emotional regulation. It plays a pivotal role in adapting behavior based on cognitive and emotional feedback. Dysregulation in ACC activity is associated with mood disorders, such as depression and anxiety, suggesting potential avenues for treatment.

Rolls, E. T. (2004). "The functions of the orbitofrontal cortex." *Brain and Cognition, 55*(1), 11-29.The orbitofrontal cortex (OFC) is crucial for evaluating outcomes,

processing rewards and punishments, and making adaptive decisions. It integrates sensory and emotional information to guide behavior. Dysfunction in the OFC is implicated in disorders like obsessive-compulsive disorder (OCD) and addiction, informing strategies for cognitive-behavioral interventions.

Corbetta, M., & Shulman, G. L. (2002). "Control of goal-directed and stimulus-driven attention in the brain." *Nature Reviews Neuroscience, 3*(3), 201-215.The parietal cortex supports attentional processes by managing both goal-directed and stimulus-driven attention. It helps in the selective focus on relevant stimuli while filtering out distractions. These mechanisms are disrupted in conditions like ADHD, guiding the development of targeted cognitive training programs.

Saxe, R., & Kanwisher, N. (2003). "People thinking about thinking people: The role of the temporo-parietal junction in 'theory of mind'." *NeuroImage, 19*(4), 1835-1842. The TPJ is integral to theory of mind, the ability to understand others' perspectives and intentions. It supports social interactions by enabling empathy and perspective-taking.Enhancing TPJ function through cognitive training can improve social skills, particularly in autism spectrum disorders.

Cools, R. (2006). "Dopaminergic modulation of cognitive function-implications for L-DOPA treatment in Parkinson's disease." *Neuroscience and Biobehavioral Reviews, 30*(1), 1-23.The basal ganglia, modulated by dopamine, are crucial for cognitive flexibility and the ability to adapt to changing environmental demands. This neural circuit is essential for learning and executing new strategies. Understanding this system aids in developing treatments for Parkinson's disease and other conditions affecting motor and cognitive functions.

Arnsten, A. F. T. (2009). "Stress signalling pathways that impair prefrontal cortex structure and function." *Nature Reviews Neuroscience, 10*(6), 410-422. Chronic stress impacts the prefrontal-limbic network, leading to impairments in cognitive functions such as working memory, decision-making, and emotional regulation. Stress hormones like cortisol can cause structural changes in the brain. Interventions targeting stress reduction can enhance cognitive resilience and prevent the negative impacts of stress on brain function.

Adolphs, R. (2009). "The social brain: Neural basis of social knowledge." *Annual Review of Psychology, 60*(1), 693-716.This review outlines key brain regions involved in social cognition, such as the prefrontal cortex (PFC), amygdala, temporal parietal junction (TPJ), anterior cingulate cortex (ACC), and insula, all critical for processing social information and emotional experiences.Understanding these neural mechanisms helps in developing interventions to improve social skills and emotional regulation in students.

2.16 SOCIAL AND EMOTIONAL LEARNING

Miller, E. K., & Cohen, J. D. (2001). "An integrative theory of prefrontal cortex function." *Annual Review of Neuroscience, 24*(1), 167-202.The PFC is essential for higher-order cognitive processes, including decision-making, social reasoning, and empathy, influencing how students interact and learn in social contexts. Enhancing PFC function through cognitive training can improve students' social interactions and academic performance.

"Emotion circuits in the brain." *Annual Review of Neuroscience, 23*(1), 155. The amygdala is pivotal in processing emotions, particularly fear and anxiety, and its activity affects students' emotional responses and stress levels. Interventions aimed at regulating amygdala activity can help reduce anxiety and improve emotional well-being in students.

Saxe, R., & Kanwisher, N. (2003). "People thinking about thinking people: The role of the temporo-parietal junction in 'theory of mind'." *NeuroImage, 19*(4), 1835-1842.The TPJ is crucial for understanding others' perspectives and intentions, a skill known as theory of mind (ToM), which develops throughout childhood and adolescence. Teaching strategies that enhance ToM can improve students' empathy and social interactions.

Bush, G., Luu, P., & Posner, M. I. (2000). "Cognitive and emotional influences in anterior cingulate cortex." *Trends in Cognitive Sciences, 4*(6), 215-222. The ACC is involved in monitoring conflicts, error detection, and emotional regulation, playing a significant role in how students manage stress and emotions. Strengthening ACC

function through mindfulness and cognitive-behavioral techniques can enhance students' emotional resilience and academic performance.

Craig, A. D. (2009). "How do you feel — now? The anterior insula and human awareness." *Nature Reviews Neuroscience, 10*(1), 59-70. The insula is involved in the perception of emotional states and empathy, influencing how students connect with others emotionally. Programs that enhance insula activity, such as empathy training, can improve students' social skills and peer relationships.

Durlak, J. A., Weissberg, R. P., Dymnicki, A. B., Taylor, R. D., & Schellinger, K. B. (2011). "The impact of enhancing students' social and emotional learning: A meta-analysis of school-based universal interventions." *Child Development, 82*(1), 405-432. SEL programs significantly improve students' social behaviors, academic performance, and emotional well-being. Integrating SEL into the curriculum can foster a supportive learning environment and enhance students' overall development.

Immordino-Yang, M. H., & Damasio, A. (2007). "We feel, therefore we learn: The relevance of affective and social neuroscience to education." *Mind, Brain, and Education, 1*(1), 3-10. Emotional engagement enhances memory retention and understanding, as emotional experiences are processed in the same neural networks that support learning. Educators should create emotionally engaging learning experiences to improve students' retention and comprehension.

Blakemore, S.-J., & Mills, K. L. (2014). "Is adolescence a sensitive period for sociocultural processing?" *Annual Review of Psychology, 65*, 187-207.Significant neural and cognitive changes occur during adolescence, which is a crucial period for the development of empathy and other social cognitive skills. Tailoring educational practices to support empathy development during adolescence can enhance peer relationships and reduce bullying.

Feldman, R. (2012). "Oxytocin and social affiliation in humans." *Hormones and Behavior, 61*(3), 380-391.Oxytocin, a neuropeptide, plays a significant role in social bonding and affiliative behaviors, affecting how students form relationships and connect with others.Enhancing oxytocin levels through social bonding activities can improve students' social interactions and emotional well-being.

Chein, J. M., Albert, D., O'Brien, L., Uckert, K., & Steinberg, L. (2011). "Peers increase adolescent risk taking by enhancing activity in the brain's reward circuitry." *Developmental Science, 14*(2), F1-F10. Peer influence significantly affects adolescent behavior by enhancing activity in the brain's reward circuitry, particularly in the nucleus accumbent. Understanding peer influence can help in designing interventions to guide positive peer interactions and reduce risky behaviors.

2.17 IMPACT OF CHRONIC STRESS ON COGNITIVE FUNCTION AND ACADEMIC PERFORMANCE

Wentzel, K. R. (1998). "Social relationships and motivation in middle school: The role of parents, teachers, and peers." *Journal of Educational Psychology, 90*(2), 202-209.The classroom social environment, including relationships with teachers and peers, significantly influences students' motivation and academic achievement. Creating a positive social environment in classrooms can enhance students' motivation and academic success.

Duckworth, A. L., & Seligman, M. E. P. (2005). "Self-discipline outdoes IQ in predicting academic performance of adolescents." *Psychological Science, 16*(12), 939-944.Self-regulation skills, more than IQ, predict academic performance in adolescents. Educational programs that focus on developing self-regulation can improve students' academic outcomes.

Blakemore, S.-J. (2008). "The social brain in adolescence." *Nature Reviews Neuroscience, 9*(4), 267-277. Adolescence is a critical period for the development of the social brain, with significant changes occurring in brain regions involved in social cognition and emotional regulation. Educators should consider the developmental stage of students when designing social and emotional learning activities.

Tang, Y.-Y., Hölzel, B. K., & Posner, M. I. (2015). "The neuroscience of mindfulness meditation." *Nature Reviews Neuroscience, 16*(4), 213-225.Mindfulness meditation enhances emotional regulation and reduces stress by altering activity in brain regions such as the ACC, PFC, and amygdala. Incorporating mindfulness practices into the curriculum can improve students' emotional regulation and stress management.

McEwen, B. S. (2000). "The neurobiology of stress: From serendipity to clinical relevance." *Brain Research, 886*(1-2), 172-189. Chronic stress negatively impacts cognitive function and academic performance by affecting brain regions such as the hippocampus and PFC. Stress reduction programs can enhance students' cognitive function and academic performance.

With the development of fundamental ideas like Bandura's Social Learning Theory and Damasio's Somatic Marker Hypothesis, social cognition and affective neuroscience became more integrated. In addition to direct instruction, Bandura (1986) highlighted the importance of observational learning and self-efficacy in social cognition, arguing that kids also learn from watching peers and teachers. According to Damasio (1994), emotions play a critical role in decision-making and are associated with the prefrontal cortex and limbic system. These hypotheses provided the framework for investigating the brain underpinnings of students' social and emotional development.

Numerous brain areas implicated in social cognitive functions have been identified by research. Understanding others' mental states (theory of mind) and self-referential thought are fundamental functions of the medial prefrontal cortex (mPFC) (Amodio & Frith, 2006). Studies using functional magnetic resonance imaging (fMRI) have revealed that when students perform activities requiring perspective-taking, the mPFC is more activated in those with superior social cognitive skills (Blakemore & Mills, 2014). Furthermore, interpreting intentions and processing social cues are related to the temporoparietal junction (TPJ) and posterior superior temporal sulcus (pSTS) (Saxe & Kanwisher, 2003).

Students' ability to control their emotions is essential for both their social and academic success. The amygdala and prefrontal cortex (PFC) are important components of this process. According to Ochsner and Gross's (2005) research, students' emotional control methods determine the degree of PFC engagement, which is modulated by the amygdala during emotional regulation tasks. Additionally, research has demonstrated how critical the anterior cingulate cortex (ACC) is for adaptive learning since it keeps track of disagreements and mistakes made during emotional tasks (Bush et al., 2000).

Students' motivation and engagement are greatly influenced by social emotions including pride, shame, and empathy. Empathy, according to Decety and Jackson (2004), involves brain circuits that are similar to those that are active during first-hand pain experiences, especially in the anterior insula and ACC. According to this shared representation, students who are sympathetic are better able to recognize and react to the emotions of their peers, which promotes a collaborative learning environment. Additionally, Immordino-Yang and Damasio (2007) contended that emotions play a crucial role in the learning process by affecting the consolidation and retrieval of memories.

One important aspect of adolescents' social and cognitive development is peer influence. Peers can be stressors, sources of support, or role models. Research on the human brain has demonstrated that the presence of peers can alter brain activity associated with taking risks and making decisions. For example, when making decisions in front of peers, teenagers showed higher activation in the orbitofrontal cortex and ventral striatum, showing heightened sensitivity to social incentives and peer approbation (Chein et al., 2011).

2.18 EVOLUTION AND IMPACT OF SOCIAL COGNITIVE AND AFFECTIVE NEUROSCIENCE IN EDUCATION

SCAN-based educational interventions have demonstrated potential in improving students' social and emotional competencies. Development of competencies in self-awareness, self-management, social awareness, relational skills, and responsible decision-making is the goal of programs like Social and Emotional Learning (SEL) (Durlak et al., 2011). According to research on neuroimaging, SEL programs may result in structural and functional alterations in the parts of the brain linked to social cognition and emotion regulation (Weissberg et al., 2015).

Students frequently experience stress and mental health problems, which can impair their ability to think clearly and feel good. Research has demonstrated that long-term stress can change the structure and function of the brain, especially in areas such as the amygdala, PFC, and hippocampus (McEwen, 2007). Memory, executive function, and emotional regulation may all be hampered by these alterations. Stress-reduction techniques like cognitive-behavioral therapy and mindfulness have been demonstrated to restore brain function and enhance academic performance (Zeidan et al., 2010).

The emergence of social media and technology brings with it both new possibilities and problems for comprehending students' social, cognitive, and affective processes. Technology can improve education and foster a sense of community, but it can also fuel problems like social comparison and cyberbullying. Excessive usage of social media has been linked to changes in the PFC and striatum, two brain areas that are important in social cognition and emotion regulation (Montag et al., 2019). Nonetheless, social and emotional learning can be supported by instructional technologies that encourage participation and teamwork (Pea et al., 2012).

Social cognitive and affective processes are significantly influenced by individual and cultural differences. Cultural norms affect how people express and control their emotions as well as how they view social interactions. Studies have demonstrated that cultural background can alter how the brain reacts to emotional and social stimuli (Chiao et al., 2009). Furthermore, the brain mechanisms underlying social cognition and affect are influenced by individual differences in personality, gender, and developmental stage (Vijayakumaretal.,2018).

Subsequent studies on SCAN among students must to tackle many obstacles. To comprehend how social and emotional brain networks change over time and are impacted by educational experiences, longitudinal research is required. To guarantee that results are applicable to a wide range of individuals, more research on these subjects is also required. The creation of successful, scalable interventions and interdisciplinary cooperation are necessary for integrating SCAN with educational practice.

Important new understandings of the brain mechanisms governing students' social and emotional processing are offered by social cognition and affective neuroscience. Educators and legislators may create interventions that promote social and emotional learning, boost academic performance, and assist students' mental health by knowing how these processes are reflected in the brain. Further investigation into this area could revolutionize teaching methods and encourage students' overall growth.

The foundation of social cognitive neuroscience was established at a conference that took place at the University of California, Los Angeles in 2001, according to the Oxford Dictionary of Psychology (Colman, 2006). Even though few of the attendees had yet to publish their discoveries in social cognitive neuroscience, this was the first

official meeting on the subject, and several of them have gone on to become leaders in the field. Neil Macrae and Jonathan Cohen gave introductory talks on social cognition and cognitive neuroscience, respectively, and there were symposia on emotion, self-control, imitation and social relations, theory of mind, and stereotypes (with William Cunningham, Andrew Whiten, Vittorio Gallese, and Wendy Mendes), as well as self-control (with Todd Heatherton, Kevin Ochsner, and Cary Savage). If this conference served as the initial instance of combining all the components of social cognitive neuroscience into one pot, then the mixture was already hot when it was added. There are a few historical threads that need to be emphasized in order to understand how the pot became this way.

John Cacioppo used the term "social neuroscience" in the early 1990s (Cacioppo, 1994) to describe the ways in which the social environment influences the neurological system. The majority of the work in this field was either animal research (Carter, 1998; Insel & Winslow, 1998; Panksepp, 1998) or health-related (Berntson, Sarter, & Cacioppo, 1998; Kiecolt - Glaser & Glaser, 1989; Segerstrom, Taylor, Kemeny, & Fahey, 1998), looking at the effects of social factors on the immune, autonomic, and neuroendocrine systems (Blascovich & Mendes, this volume). Put differently, the primary focus of early social neuroscience was on the impact of social environments on the peripheral nervous system and other physiological systems. While social neuroscience undoubtedly includes neurocognitive pathways, throughout the 1990s there were relatively few studies examining the relationship between social and brain processes. A recent development in social neuroscience, social cognitive neuroscience is mainly concerned with the neurological underpinnings of commonplace social cognition. Consequently, due to the merging of the study topics and methodologies, the phrases "social neuroscience" and "social cognitive neuroscience" have essentially become synonymous.

There were sporadic research programs concentrating on social cognitive neuroscience in the 1990s, even though the field of social cognitive neuroscience reached its boiling point around 2001, when many scientists started employing neuroscience techniques to explore social cognition. In social cognitive neuroscience, affective neuroscience (Panksepp, 1998), and neuroeconomics (Camerer, Loewenstein, & Prelec, 2005), Antonio and Hannah Damasio's work on the socioemotional changes in individuals with ventromedial prefrontal cortex (PFC; see

Table 5.1 for a list of acronyms and neuroscience terms used in this chapter) (Bechara, Damasio, Damasio, & Anderson, 1994) sparked intense interest. In the middle of the 1990s, Chris and Uta Frith started a very productive line of research on the neurological underpinnings of theory of mind (Fletcher et al., 1995). This field of study is fundamental to social cognitive neuroscience. The finest early example of how neuroscience could place limitations on social psychology ideas was provided by Stan Klein and John Kihlstrom's examination of self-knowledge in a patient who had experienced transitory amnesia (Klein, Loftus, & Kihlstrom, 1996). During this time, there was some advancement in the study of the neurological underpinnings of face and biological motion processing (McCarthy, Puce, Gore, & Allison, 1997), but not to the point where it addressed issues common to social psychology. Lastly, Cacioppo, Crites, and Gardner (1996) used event-related potentials (ERPs) to study the neurological underpinnings of attitudes and evaluative processing and revealed significant differences across social cognitive processes that at first glance appeared to be comparable. Many people who would go on to study in the field of social cognitive neuroscience were inspired by these research streams, which are the forerunners of the field.

Ultimately, the development of social cognitive neuroscience required a significant investment of human capital. Well-known researchers in the field of social neuroscience, including Ralph Adolphs and John Cacioppo, actively supported financing and publishing of studies in social cognitive neuroscience. Renowned social psychologists such as Todd Heatherton, Mahzarin Banaji, Neil Macrae, and Susan Fiske initiated social cognitive neuroscience studies and provided much-needed validation to this emerging field of study. Lastly, before the field of study even existed, Steve Breckler and Carolyn Morf, program officers at the National Institute of Mental Health (NIMH) and the National Science Foundation (NSF), respectively, had the foresight to provide funding for young scientists working in this field.

Combine all of these components, add a healthy dose of driven graduate students, and presto—social cognitive neuroscience. The term "social cognitive neuroscience" was initially used in two studies in 2000 (Ochsner & Schachter, 2000; Liebman, 2000), and Phelps et al. (2000) reported the first functional magnetic resonance imaging (fMRI) study investigating a conventional social psychology topic. The first review of social cognitive neuroscience was published in 2001 (Ochsner & Lieberman, 2001),

however the review was really more of a promissory note than a progress report at the time due to the dearth of published research at the time.

2.19 ETHICAL CONSIDERATION IN SCAN RESEARCH

Social cognitive neuroscience is created when all of these elements are combined, along with a healthy dose of motivated graduate students. In 2000, two research (Ochsner & Schachter, 2000; Liebman, 2000) utilized the term "social cognitive neuroscience" for the first time, while Phelps et al. (2000) published the first functional magnetic resonance imaging (fMRI) study examining a traditional social psychology issue. The first review of social cognitive neuroscience appeared in 2001 (Ochsner & Lieberman, 2001), but because there wasn't much published research at the time, the review was really more of a promissory note than a progress report.

A number of journals, including Journal of Personality and Social Psychology (2003), Neuropsychologic (2003), Journal of Cognitive Neuroscience (2004), Neuroimage (2005), Brain Research (2006), New York Academy of Sciences (2007), Group Processes and Intergroup Relations (2008), and Child Development (2009), have published special issues on social cognitive neuroscience. In order to publish research in this field, Social Neuroscience and Social Cognitive and Affective Neuroscience (SCAN) were established as two new journals in 2006. The National Institute of Mental Health, National Institute of Drug Addiction, National Institute of Aging, and the National Institute of Alcohol Abuse and Alcoholism are among the funding bodies that have launched special funding efforts for social cognitive neuroscience. Ultimately, a yearly conference on Social and Affective Neuroscience (SAN) has replaced a series of preconference's and local gatherings on social cognitive neuroscience. Social cognitive neuroscience has evolved dramatically in the past 10 years, from essentially non-existent to possessing a solid foundation and other hallmarks of a legitimate scientific field.

An important trend for comprehending and investigating the social, cognitive, and neural processes that emerge during human–human as well as human–machine interactions is the integration of recent advances in social cognitive and affective neuroscience (SCAN) into the development of novel human–machine systems. Despite the fact that SCAN is still a relatively young topic, applications from it could significantly progress the creation of human-machine systems in the future.

More precisely, three examples are given in this study to show the wide multidisciplinary applicability of SCAN and the ways in which further research can improve a number of humans–machine systems through its application. In order to facilitate better learning outcomes in less time, these include descriptions of how to: 1) improve technologies so that they better adapt to students and trainees; 2) inform the field of human–robot interaction (HRI) more broadly by offering insights from human–human interactions to model social cognitive mechanisms in robots and provide techniques for investigation of the ways in which social cognitive mechanisms are employed when humans interact with robots; and, finally, 3) by bringing to light novel constructs that are worth examining neuro physiologically in order to serve as parallel metrics of team performance.

These three subjects were carefully picked because they not only represent representative fields of study in the field of human-machine systems research, but also because of their multidisciplinary nature, which highlights the wide range of applications that SCAN may be used for. These examples also have certain fundamental characteristics in common with a lot of human-machine systems, such as the need for training, the prevalence of automation or machine intelligence, and the fact that most use cases include teams or groups.

Our objective is to encourage future interdisciplinary partnerships between SCAN researchers and the researchers and developers of complex human–machine systems by showcasing the multidisciplinary value of SCAN in these applications. For our purposes, researchers and developers of human-machine systems are considered to be in the fields of augmented cognition and operational neuroscience, while SCAN researchers are thought to be those who are typically trained in the tools and techniques of cognitive neuroscience and seek to uncover fundamental truths about the neural underpinnings of human social cognition and affect.

Those working in these domains usually concentrate on integrating data from neurophysiological sensors about a person's cognitive state with a sophisticated technological system to modify the system's operations and improve human performance in practical contexts. Thus, by a methodical balancing of basic and applied research aims and approaches, the type of integration presented here promotes a more ecological approach to the design of human–machine systems.

Although many of the neurophysiological measures used in SCAN are also used by researchers in augmented cognition and operational neuroscience (e.g., electroencephalogram, functional magnetic resonance imaging, and functional near-infrared spectroscopy), the significance of the social cognitive and affective dimensions has not yet been emphasized or highlighted in these studies.

That is to say, a lot of research on human-machine systems concentrates on the technology and interface design aspects as well as task-specific cognitive processes. However, scholars in this field recognize this requirement and assert that "any applied setting must factor in the influence of the individual's non task related states". Given that the majority of human-machine systems are socially situated by nature—that is, made up of teams, organizations, and groups—and that these systems accomplish their common objectives through both task-relevant and social interactions, we contend that closing this gap is imperative.

Teams made out of human-machine systems are therefore essentially social systems. Moreover, other perspectives contend that cognition is intrinsically tied to society and socially located in general. Stated differently, the relationship between performance in human-machine systems research and the social, cognitive, and affective components is relatively new and fills a knowledge vacuum that could have a practical and theoretical impact on future study. This paper is organized as follows as a result. First, a synopsis of SCAN and social cognition is given. The three SCAN sample applications that were previously mentioned are then expanded upon in the following sections. Lastly, a brief discussion is offered to clarify the following stages for the integration that are suggested here.

2.20 SOCIAL AND EMOTIONAL LEARNING INTERVENTIONS

The interdisciplinary discipline of social cognitive and affective neuroscience (SCAN) aims to comprehend how social and emotional processes impact students' learning and development by bridging the gaps between neuroscience, psychology, and education. This area of study looks at the neurological foundations of emotions, social relationships, and cognitive functions. It provides important insights into how students interact with peers, professors, and course materials.

Understanding that learning is fundamentally a social activity is at the heart of SCAN. Pupils are impacted by their contacts with others, whether it is through group projects, class discussions, or peer evaluations; they do not learn in a vacuum. SCAN

research has demonstrated that some brain regions, such as the temporoparietal junction (TPJ), which is involved in empathy and theory of mind, and the medial prefrontal cortex (mPFC), which is important in comprehending others' viewpoints, moderate these social interactions. These areas support students in navigating social difficulties, which helps them build meaningful relationships and collaborate well—two abilities necessary for both academic success and personal growth.

Emotions are essential to the learning process as well. Affective neuroscience is the study of how emotions affect behavior and thought processes. The amygdala, which is linked to emotional reactions, and the ventromedial prefrontal cortex (vmPFC), which is involved in emotion regulation, are important brain areas involved in processing emotions. It has been demonstrated that pleasant emotions like enjoyment and curiosity increase motivation and engagement, which improves learning results. On the other hand, unfavorable feelings like stress and worry can interfere with cognitive functions and lower academic achievement. Chronic stress, for example, can cause the amygdala to become overactive and the prefrontal cortex to become underactive, which can lead to problems with executive function, memory, and attention.

The significance of establishing nurturing and emotionally secure learning settings is emphasized by SCAN research. In this sense, teachers are crucial because of the profound effects that their social actions and emotional expressions have on students' emotional states and, by extension, their learning. For instance, a teacher can improve students' sense of self-worth and belonging in the classroom by creating a pleasant and inclusive environment. These emotions are essential for learning to occur effectively. Additionally, by offering interventions that lessen the harmful consequences of stress and anxiety, instructors who are sensitive to the emotional needs of their pupils can better support individuals who are struggling.

Additionally, SCAN has investigated how prejudices and social identities affect education. According to social identity theory, people get a sense of who they are from belonging to certain groups, and this can have an impact on how motivated and involved they are in learning environments. It has been demonstrated that stereotype threat, or the anxiety of verifying unfavorable preconceptions about one's group, lowers performance, especially for marginalized groups. Studies on the neurosciences have shown that stereotype threat can activate brain regions linked to social and

emotional processing, heighten anxiety, and take cognitive resources away from the activity at hand. Educators may create ways to lessen the threat of stereotypes and foster an inclusive environment that supports all students by having a thorough understanding of these dynamics.

SCAN analysis has also been applied to the usage of technology in education. Social learning can be promoted via digital tools and platforms that allow for communication and cooperation outside of the traditional classroom. For example, virtual learning environments can give students the chance to participate socially and get feedback right away, both of which can improve their learning process. However, worries about screen time and its effects on social and emotional development are also raised by our growing reliance on technology. SCAN research indicates that while educational technology use in moderation can be helpful, excessive screen time may hinder face-to-face interactions and social skill development.

The investigation of student empathy and prosocial behavior is a key topic of SCAN research. Establishing healthy social connections and a welcoming learning environment require empathy, or the capacity to comprehend and experience another person's emotions. Studies in neuroscience have revealed that brain networks such as the anterior insula and anterior cingulate cortex are involved in empathy. These networks facilitate prosocial behaviors like cooperation and charity by enabling people to recognize and react to the emotions of others. Encouraging empathy in the classroom can result in a more courteous and cooperative learning environment, which will benefit all students' academic performance.

SCAN-based interventions have been created to enhance social and emotional learning (SEL) in classrooms. The goals of SEL programs are to impart on kids abilities like effective communication, empathy, and emotional control. It has been demonstrated that these programs raise students' general well-being, decrease behavioral issues, and boost academic achievement. The effectiveness of social and emotional learning (SEL) is supported by neuroscientific research that shows improvements in emotional and social abilities are linked to altered brain activity and connectivity. For instance, it has been demonstrated that mindfulness exercises, which are frequently included in SEL programs, lower stress and enhance activation in brain areas related to attention and emotional regulation.

SCAN research also has implications for comprehending learning disparities among individuals. The social and emotional experiences that students have differ, and this can have an impact on how they grow cognitively and perform academically. Children raised in loving and caring surroundings, for instance, may grow up with better social and emotional skills, which might help them study. On the other hand, those who have experienced negative events, like abuse or neglect, could struggle to comprehend social and emotional information, which could affect how well they learn. Teachers can adapt their teaching strategies to better suit the varied requirements of their pupils by having a better understanding of these individual distinctions.

Professional development and teacher preparation are further components in integrating SCAN into educational practice. In order to promote students' social and emotional development, educators must possess the knowledge and abilities to comprehend the social and emotional components of learning and to put those parts into practice. Teachers can improve student engagement and accomplishment by creating more effective and compassionate learning environments with the support of professional development programs that include SCAN principles.

To sum up, social cognitive and affective neuroscience provide important new perspectives on how emotions, learning, and social interactions interact. Teachers may establish more encouraging and productive learning environments that assist students' cognitive, social, and emotional growth by having a better grasp of the brain mechanisms behind these activities. The field's research has the potential to impact educational methods and policies that better address the needs of all students, promoting their success both inside and outside of the classroom, as it continues to develop.

CHAPTER – 3
THEORETICAL FRAMEWORK

CHAPTER – 3

THEORETICAL FRAMEWORK

3.1 UNDERSTANDING SOCIAL COGNITIVE AND AFFECTIVE NEUROSCIENCE IN EDUCATIONAL CONTEXT

In order to comprehend how social interactions and emotional processes affect behaviour and learning, social cognitive and affective neuroscience (SCAN) among students blends concepts from education, neuroscience, and psychology. This multidisciplinary approach investigates the neural mechanisms underlying affective processing (emotional reactions) and social cognition (the capacity to gather, organize, and apply knowledge about other people and social contexts) in educational contexts.

The neurological mechanisms underlying social interactions are the subject of social cognitive neuroscience. Two major areas of study are the theory of mind, which enables people to predict other people's behaviour and assign mental states to them, and the mirror neuron system, which helps people comprehend and mimic the activities of others. In the classroom, these procedures are critical for fostering empathy, collaborative learning, and successful communication. For example, in group work, students' capacity to read and anticipate the feelings and thoughts of their colleagues might improve collaboration and academic performance.

Conversely, affective neuroscience studies how the brain processes and regulates emotions. Emotions have a big impact on memory, motivation, and attention—three things that are essential to learning. While negative emotions like stress and worry can hinder learning by depleting cognitive resources and motivation, positive emotions like interest and enjoyment can increase students' engagement and readiness to take on difficult activities. By being aware of these dynamics, educators may provide safe, nurturing settings in the classroom that minimize unpleasant emotional experiences while fostering positive ones.

Social-emotional learning (SEL) programs make the integration of social cognition and affective neuroscience in education very pertinent. The goal of SEL is to help students become more adept at goal-setting, relationship-building, emotion management, and responsible decision-making. Research from the neuroscientific

community backs up SEL by showing how these abilities are ingrained in brain function and may be developed with certain interventions. For instance, it has been demonstrated that mindfulness exercises improve executive function and emotional regulation, which improves social and academic functioning.

This paradigm also highlights the significance of early interventions. Adolescents' minds are especially flexible, going through major transformations that impact how they interpret emotions and social interactions. Students are particularly vulnerable to peer pressure and social feedback during this time, which can affect how they behave and how they see themselves. The creation of initiatives that take use of this plasticity to foster social behaviors and resilience can be guided by neuroscientific understandings.

Technological developments like electroencephalography (EEG) and functional magnetic resonance imaging (fMRI) have made it possible for researchers to see brain activity related to social and emotional processes in real time. These resources give educational practices a scientific foundation by presenting empirical evidence on the effects of various instructional pedagogies and classroom setups on brain function. For example, functional magnetic resonance imaging (fMRI) research has demonstrated that cooperative learning stimulates reward and social processing brain areas, underscoring the advantages of peer engagement in the classroom. Additionally highlighting the importance of individual differences in learning is the SCAN theoretical framework. The social-cognitive skills and emotional reactions of students differ because of hereditary, developmental, and contextual factors. By taking these variations into account, personalized education strategies can improve learning results by meeting the individual needs of each student. For instance, specialized interventions that target particular issues in interpreting social cues and controlling emotions may be beneficial for students with social communication impairments, such as those on the autistic spectrum.

In summary, a thorough knowledge of how social interactions and emotional processes affect student learning and behavior is provided by the theoretical frameworks of social cognitive and affective neuroscience. This method offers a scientific basis for creating treatments that support academic success, improve engagement, and develop social-emotional skills by incorporating neuroscience findings into educational practices. Research in this area has the potential to

revolutionize teaching methods and improve learning by being more inclusive, effective, and sensitive to the different requirements of students.

3.2 TECHNIQUES AND STRATEGIES FOR MANAGING EMOTIONS

In order to comprehend how social and emotional processes affect behavior and learning, the Social Cognitive and Affective Neuroscience (SCAN) theoretical framework among students combines concepts from psychology, neuroscience, and education. This framework consists of the following essential elements:

1.Social Cognition

Understanding how people gather, organize, and use knowledge about other people and social contexts is a key component of social cognition. For pupils, this includes: Theory of Mind (ToM): The capacity to assign one's own and other people's mental states, which is essential for developing empathy and adopting a perspective. Social learning, which is largely influenced by mirror neurons, is the process of learning by watching and copying others. Comprehending how students rationalize their own actions as well as those of others (e.g., attributing success to effort vs. intrinsic ability) is known as attribution theory.

2. Affective Neuroscience

The study of affective neuroscience focuses on how the brain represents emotions and how they affect behaviour and thought processes. In terms of students, this comprises: Emotion Regulation: The techniques pupils employ to control their emotions, which is essential for handling stress and difficult situations.

Emotional Intelligence (EI): The capacity to recognize, make use of, comprehend, and effectively regulate emotions.

Reward Processing: The way the brain interprets rewards and penalties influences learning motivation and engagement.

3.Neural Correlates

Recognizing the areas and networks of the brain related to social and affective processes:

Prefrontal Cortex (PFC): Associated with emotion control, decision-making, and executive processes.

Amygdala: Essential for processing emotions, including fear and learning associated with rewards.

Mirror Neuron System: Enables imitation and comprehension of the intents and behaviours of others.

Default Mode Network (DMN): Intact during social and self-referential thought processes.

4. Educational Implications:

Using SCAN's insights to improve teaching methods

Social-Emotional Learning (SEL): Courses designed to improve students' emotional and social intelligence.

Collaborative Learning: Making the most of peer relationships to improve learning results.

Stress Reduction Interventions: Methods to enhance academic performance and emotional regulation, include biofeedback and mindfulness.

Reward and Feedback Systems: Organizing incentives and feedback in a way that maximizes encouragement and reinforcement.

5. Developmental Considerations

How social and emotional development affects learning at various educational stages and how it evolves over time:

Early Childhood: Focus is placed on helping children learn fundamental social skills and emotional control.

Adolescence: Put an emphasis on forming one's identity, interacting with peers, and handling growing social and academic demands.

Higher Education: Development of self-control, emotional intelligence, and readiness for adult social duties and responsibilities.

6.Methodologies

Research techniques employed to investigate SCAN instudents:

Neuroimaging: Methods for monitoring brain activity connected to social and emotional processes, such as fMRI and EEG.

Behavioral Assessments: Instruments to evaluate emotional intelligence and social cognition.

Longitudinal Studies: Monitoring alterations over time to comprehend how social and affective abilities evolve.

Integration and Application

Educators, psychologists, and neuroscientists can better understand and support kids' social and emotional development by integrating these components into a coherent framework. Teachers can design learning environments that support students' academic success as well as their general well-being and interpersonal skills by implementing the SCAN principles. This framework emphasizes the need of a comprehensive approach to education that takes into account the interplay of cognitive, social, and emotional aspects. It also emphasizes the necessity of continuous research and practice in order to maximize educational outcomes.

3.3 METHODS AND ANALYSIS

Social Cognitive Neuroscience Methods

Understanding the methods and procedures (this part) used to infer social psychological processes in the brain is necessary before diving into a review of what has been learnt using the instruments of social cognitive neuroscience. Lesion investigations and neuroimaging methods (fMRI, PET, ERP) are the main instruments used.

- Positron Emission Tomography

PET was the first type of neuroimaging to concentrate on the functional localization of the brain. During a PET scan, radioactive tracers are either injected or inhaled by the patient, and they bind to molecules that are physiologically active. The location of the tracers' passage in the brain during various types of mental activity can then be determined using PET, which detects the gamma rays from these tracers. PET scans

often have a spatial resolution of roughly a cubic centimeter and a temporal resolution of roughly a minute (one aggregate data point per minute). The biggest benefit of PET, aside from being the first method of whole brain functional neuroimaging, is the ability of tracers to tag various molecules, enabling research to look at both the distribution of neurochemical processes and cerebral blood flow.

- Functional Magnetic Resonance Imaging

PET was the primary method of functional neuroimaging until functional magnetic resonance imaging (fMRI) emerged as a non-invasive method. This is mainly due to fMRI's superior temporal resolution (1 to 2 seconds) and spatial resolution (about 3 mm 3). Blood oxygen level-dependent (BOLD) fMRI is used in the majority of fMRI research to identify the brain areas that are mostly or mostly engaged during psychological tasks. According to the theory behind BOLD fMRI, blood flowing to an active region is more oxygenated than blood flowing elsewhere, and oxygenated blood differs from deoxygenated blood in terms of its magnetic properties. fMRI can identify the precise location of these distinct magnetic properties and reconstruct the area of the blood flow. One drawback of fMRI is that it usually requires multiple trials to represent each condition of interest, which might result in contamination and habituation effects. Furthermore, almost every fMRI analysis compares different experimental settings within a person, usually combined across participants. Even these are within-subject comparisons between groups; between-group analyses are the exception rather than the rule. If participants are exposed to every task condition, it becomes more challenging to replicate various social psychological findings using fMRI.

- Event - Related Potentials

An electroencephalograph (EEG), which monitors the total electrical activity from neurons firing in the outer layers of the cortex, is the source of event-related potentials (ERPs). ERPs are consistent responses that are averaged across multiple trials and are time-locked to a stimulus or reaction. The two main benefits of ERPs are their ability to monitor brain electrical activity directly and their millisecond temporal precision, which enables precise time course measurement. The fact that ERPs can only accurately measure the outer cortex and have very low spatial resolution are two of their drawbacks.

- Lesions

One can ascertain the contributions of the injured regions to psychological function by looking at people who have had injury to various brain regions and noting the resulting psychological deficiencies. Lesion studies have a significant advantage over neuroimaging techniques in that the former can make causal inferences while the latter merely identify regions active during psychological processes. Lesion studies are primarily constrained by the fact that damage is rarely localized to a single brain region, making it challenging to draw conclusions about a particular area.

- Transcranial Magnetic Stimulation

Certain limitations of lesion investigations are addressed by transcranial magnetic stimulation (TMS), which enables the production of transient lesions to a specific region of the cortex. Electromagnetic pulses, which excite the neurons in a limited region of cortex, constitute the basis for TMS. Usually, the goal of this is to stimulate the neurons until they become inefficient. This recurrent TMS effectively knocks a part of the brain offline for a few minutes, enabling researchers to identify which transient lesions cause impairments in performance on relevant activities.

- Neuroimaging Analyses

Since fMRI has been employed in the majority of published social cognitive neuroscience research, it is important to go into further detail about the analyses that are done using fMRI data (also refer to Lazar, 2008). The social psychologist reading this section may be interested in learning more about how to deduce that "region X is more active during task A than during task B" without having to wade through a ton of technical terms.

- Pre-processing

Usually, pre-processing is done on fMRI data before analysis is done. This means that in order to prepare the information for analysis, a number of operations are performed on the raw data that are gathered during scanning. It is comparable to statistically normalizing scales prior to combining them or using log transformations to increase the normality of a distribution. Realignment, normalization, and smoothing are the typical pre-processing steps in fMRI investigations. It should be highlighted that while each of these procedures improves the signal in different ways, it also adds some noise to it. Every one of these steps is based on assumptions, and these

assumptions are never perfectly implemented in practice. The technique of realignment adjusts the brain pictures to take into consideration the head movements of the patient during the scan. It is possible to change whether a signal appears to be originating from one brain region or another with tiny movements of a few millimeters in any direction. Realignment "puts the brain back" in the same location as it was after a reference scan by using structural characteristics of the brain to ascertain how the brain has migrated. When realignment is effective, it guarantees that certain regions of the brain, such the amygdala, remain visible in the recorded brain images for the duration of the data collection. While realignment endeavors to guarantee that each individual's brain preserves its distinct "coordinate space," normalization aims to consolidate all of the subjects' realigned brain scans into a solitary coordinate space, so ensuring that the brain structures correspond among individuals. varied brains have varied forms and sizes, and normalization essentially turns them into one common area. Programs vary in how they accomplish this, and no technique is ideal.

The final crucial preprocessing step is spatial smoothing. In order to smooth the brain images, an average is taken over neighboring "voxels," or three-dimensional [3D] pixels. While there are some advantages to this in terms of improving the identification of specific signal types, it comes at the cost of lowering the possibility of identifying other signal types. Generally speaking, this is a good trade-off, but it shows once more how the data used in fMRI studies are very different from their original state and are the result of numerous choices and modifications that either make the data easier to analyze or cause issues when the data don't match the assumptions that led to those modifications. This is similar in many respects to the hypotheses put out in statistical analysis, yet it frequently goes untested in our behavioral research (heteroscedasticity, anyone.

- Whole - Brain Analyses

The vast majority of fMRI research analyses that are published compare brain activations across all voxels in the brain under two task conditions, or whole-brain analyses.

Consider a study where participants look at photographs of members of their own group for thirty seconds at a time, then members of the outgroup, for a total of three

minutes. Let's say we are interested in finding out which areas of the brain are active differently in these two scenarios. Every three seconds, the MRI scanner may gather a full brain volume, or a collection of images collected simultaneously that, when stacked, encompass the entire brain. This results in a total of sixty volumes taken during the three-minute scan. Every one of the 60 volumes corresponds to a time point; hence, there is a 60-point time series representing the relative activation of every voxel in the brain at each location. To create a hypothetical time series of what a brain region's activity would look like if it were differentially sensitive to the two conditions of the experiment, statistical tools are used to convolve the experimental design with a hypothetical BOLD response, or a model of how the blood oxygenation typically rises and falls over time in an active area. In order to determine which brain voxels exhibit an activation pattern that is consistent with the hypothesis, this predicted time series is then regressed against the real time series at each voxel. It is commonly assumed that a brain region is more active under certain conditions when multiple contiguous voxels from that region exhibit the proposed pattern over time. When brain scans with yellow and orange "blobs" appear in published studies, they usually indicate regions that are consistent with the experimental regressor and cross a criterion (e.g., 10 contiguous voxels with regression values of $p < .001$).

These studies identify the areas of a single subject's brain that are responsive to the demands of the task. Since extrapolating to the broader population is typically of interest to us, we combine single-subject whole-brain analysis with cross-subject analyses to identify the brain regions that are consistently active. In order to do this, one sample t-test is computed at each voxel utilizing the regression coefficients, or parameter estimates, from each individual at that same voxel. In these random effects study, a region's average parameter estimate from each subject in that region will become significant if it is large enough.

- Region of Interest Analyses

ROI (region of interest) analysis results are frequently reported in neuroimaging investigations. These analyses show the search for noteworthy activations within a particular brain area. ROI analyses can be used in a study for a variety of reasons. Because fewer statistical tests are run simultaneously when searching inside a smaller brain region, there is less work to be done when adjusting for multiple comparisons.

Additionally, it enables a priori hypothesis testing by purposefully looking in areas of the brain that are assumed to be pertinent to the comparison. This is comparable, in certain respects, to doing one-tailed t tests instead of two-tailed t tests, when a more lax test can be carried out due to the exact specification of the hypothesis. Papers that only use the ROI approach have the regrettable side consequence of possibly creating the false impression that only the regions under examination are engaged in a process of interest.

Regardless of the reason behind a ROI analysis, it's critical to understand the specific kind being presented. Different ROI studies can be distinguished from one another in at least two ways. Initially, a ROI might be established physically or functionally. Using brain imaging, an anatomically defined ROI aims to identify the actual boundaries of each brain region.

Functional ROIs leverage an existing pattern of activation to determine the ROI rather than physical limits. For example, a "localizer scan" (Saxe, Brett, & Kanwisher, 2006) could be used to define a region of interest (ROI) based on a task that is known to stimulate a certain brain structure. The ROI could then be examined under novel experimental conditions.

The second type of differentiation found in ROI analysis relates to the treatment of the ROI as either a "supervoxel" or a "search space." Certain ROI analyses view the ROI as an area where meaningful activation clusters can be found. In some ROI analyses, the ROI is viewed as a single entity that can be considered significant in its entirety or not.There are other types of ROI analyses that were not covered, but all of the ones that were are valid. However, because each type of ROI has various restrictions and enables different sorts of inferences, it is crucial to understand which type is being used.

- Connectivity Analyses

Instead than concentrating on the distinct functions of each brain region, researchers are becoming more and more interested in the connections between them. An measure of the degree to which brain regions exhibit coordinated activity under specific task settings is provided by connectivity analysis. In social cognitive neuroscience, inverse connection is particularly interesting since it shows that two brain regions exhibit a pattern that is consistent with one region controlling the other. The correlations

indicate the regions that are likely to have causal effects, but they do not prove causality because these analyses are only correlational in nature.

Within-subjects and between-subjects analyses broadly correlate to two primary types of connectivity analysis. Though much simpler to do, between-subjects connectivity analyses are less likely to be able to show conclusively whether different brain regions are truly cooperating or competing with one another. A single estimate of activity for each subject in one brain region is correlated with a single estimate of activity for each subject in a different brain region in these kinds of analyses. These analyses show whether there is a relationship between the amount of brain region X activation during task A relative to task B and the amount of brain region Y activity during the same task comparison. For example, there is an inverse relationship between the amount of activity in a prefrontal cortex region during self-control attempts and the amount of activity in the amygdala across people when compared to a baseline task. This procedure's drawback is the use of a single, average estimate of activity during the task (i.e., the average amount of prefrontal area activation across all self-control trials of the task). hence it doesn't discuss the temporal dynamics of the various brain areas.

This problem is addressed by the second type of connection, known as functional connectivity, which measures the degree of correlation between the time series of activation in two locations. Functional connectivity specifically evaluates whether there is a stronger correlation between the activation time series of brain areas X and Y during task A compared to task B. Every topic must first undergo this analysis on an individual basis before being combined with other subjects. These analyses have a conceptual drawback in that they usually evaluate the correlation between brain areas only at one particular point in time.

It is conceivable that there may be time lags of several seconds in the real dynamics between some regions (for example, two seconds of prefrontal effort toward self-control may be required before downstream reductions in amygdala area are noticed). Since a between- subjects connection study does not assume anything about the temporal dynamics, it may still be able to capture this impact, but a functional connectivity analysis is likely to miss it. Work is being done on solutions to these issues that take hypothesis-driven time lags into account (Formisano et al., 2002).

- Regression Analyses

Regression analysis is a common technique in social cognitive neuroscience, as social psychologists are interested in the ways that social and personality characteristics interact to influence task behavior in fMRI. Using regression analyses is simple in most fMRI statistical tools. In this case, a whole-brain comparison of two task circumstances is performed using a vector of regression results, one value per subject. The result will resemble any whole-brain analysis, complete with brain maps showing activation clusters and p values for each voxel demonstrating the reliability of the correlation. Refer to the works by Vul et al. (2009) and Lieberman, Berkman, and Wacher (2009) for a discussion of the labeling of such analyses as "voodoo." This method can be applied to any characteristic, level, or self-report measure to investigate potential relationships with the activity pattern among subjects. It has been studied how trait characteristics such as neuroticism, rejection sensitivity, and socioeconomic level relate to brain responses. In order to investigate the relationship between behavior that follows scanning procedures and brain responses during a pertinent task in the scanner, one can also evaluate behavior that follows the procedures. For example, one may investigate the relationship between individual differences in the amount of imitation-related brain activity during an fMRI scanning session and individual differences in automatic mimicry in a laboratory setting. This type of regression analysis is basically just a specific application of the between-subjects connectivity analyses that were previously discussed.

Additionally, at the single-subject level, physiological, behavioral, or self-report data collected during the scanning session itself can be used as a regressor. Similar to functional connectivity, the relationship between the two is ascertained by correlating the regressor of interest and the activity time series. For example, in a study, fifty pieces of art may be presented, and the subject's assessment of desirability for each would be obtained. The brain areas that exhibit activity that rises and falls in tandem with this psychological response within a subject can then be identified by entering these ratings as a regressor that unfolds over time.

- Reverse Inference

A specific challenge in deriving psychological conclusions from neuroimaging data is known as "reverse inference" (Poldrack, 2006). Neural activations should ideally function as indicators of the occurrence of a specific psychological process. Social

psychologists, who are aware of the limitations of self-report and introspection, would benefit greatly if we could state with confidence that every time the amygdala is active, fear processing of some kind has taken place (Nisbett & Wilson, 1977). Regretfully, the amygdala is triggered by a variety of task situations, including as receiving a reward. Reverse inferences become far less trustworthy in the absence of a one-to-one relationship between function and structure (Ochsner, 2007).

Reverse inference is, in fact, and will remain a component of nearly all studies. Outside of fMRI studies, it differs just marginally from that. For example, reaction times can differ for a variety of reasons, therefore it is erroneous to assume that they always reflect the complexity or quantity of underlying activities. Although there will always be a chance of an inferential error with reverse inference, there are a few things that may be done to reduce the risk.

First, there is a significant benefit to concentrating on networks of brain regions as opposed to individual brain regions. For example, when people engage in theory of mind or mentalizing activities (i.e., thinking about the psychological states and qualities of another), the dorsomedial PFC, posterior superior temporal sulcus (STS), and temporal poles are frequently coactivated (Frith & Frith, 2003). There is minimal evidence that all three regions are coactivated in situations where mentalizing is not involved, despite the fact that the temporal poles may be active under other task conditions (e.g., semantic processing) (Cabeza & Nyberg, 2000). Therefore, while any one of the three regions alone might not be a reliable marker for mentalizing, the three together might be. Connectivity analyses can further support the inference by indicating that these regions are cooperating with one another during a given task. Localizer scans are also beneficial. Using the specific regions used for mentalizing, functionally defined ROIs can be constructed for each subject if they complete an explicit mentalizing task before moving on to a second activity where we would like to covertly assess whether mentalizing is occurring. Next, it is possible to find out if those identical ROIs are active in the next task.

- Eye Movement Confounds

Before we conclude this part, we should also take into account how eye movement may significantly change how we perceive behavioral and neuroimaging data. When faced with emotive faces, autistic people have been found to exhibit reduced amygdala activity in comparison to healthy matched control subjects (Baron - Cohen

et al., 1999; Pelphrey, Morris, McCarthy, & LaBar, 2007). The first conclusion made was that those with autism have less sensitive amygdalae to faces and the emotions they conveyed. Nevertheless, compared to healthy people, autistic people also spend less time examining a face's eyes, despite the fact that eyes are crucial for recognizing emotional expressions (Adolphs et al., 2005). There were no longer any variations in the amygdala responses of autistic versus control patients once eye gaze differences were taken into consideration utilizing the scanner's eye-tracking equipment (Dalton et al., 2005). Likewise, upon retesting with instructions to focus on the eyes of target faces, a patient with amygdala damage who had trouble identifying fear expressions (Adolphs, Tranel, Damasio, & Damasio, 1994) performed at normal levels (Adolphs et al., 2005). The initial findings are interpreted differently by these results, which imply that the amygdala directs attention to salient environmental signals and that people with autism and amygdala damage are less likely to do so on their own. Another alternative is that autistic people's amygdalae are hypersensitive to upsetting social information rather than hyposensitive, which causes them to gaze less at these stimuli. It makes sense to assume that a brain region's sensitivity to a certain class of stimuli is reflected in the degree to which it reacts to a stimulus shown in the scanner. Different interpretations may result from knowing the individuals' gaze patterns, attention spans, or thoughts throughout the sensory processing phase.

An increasing amount of research has been focused on elucidating the neurophysiological foundations of human social cognition for more than ten years. With a particular focus on how people are able to interpret the intentional, affective, and other mental states of others in order to respond appropriately, social cognition is specifically thought to encompass the perceptual, behavioral, and cognitive processes involved in human social interactions [9]. Therefore, interpersonal knowledge, person perception, and self-perception are all incorporated into social cognition, which is used to understand other people's mental states and promote productive interactions. This is distinct from the more general study of cognition in that the goal of cognition is the social domain (i.e., other people), frequently with the express intention of adaptively regulating social interactions.

Thus, SCAN is an interdisciplinary discipline that was initially based on three levels of analysis and aims to explain social cognitive and affective processes .SCAN specifically aims to explain human behavior at three levels: social, where it takes into

account concepts like attitudes, motivations, and culture that are commonly studied in social psychology; cognitive, where it concentrates on the ways in which social information is processed; and neural, where it looks at the neural substrates connected to the social and cognitive processes mentioned above. Finally, the study of emotions is linked to the basic brain substrates as well as the social and cognitive levels of analysis. SCAN, in summary, studies the social and affective dimensions of human cognition and behavior by combining techniques from cognitive and social psychology with techniques from neuroscience.

The aforementioned distinctions served as a helpful introduction to the topic of SCAN, but a more current summary of the research conducted in this area within the last ten years is more helpful in comprehending the field at hand. In particular, SCAN research is shown by Chatel-Goldman et al. to cluster into three domains: theory of mind, coordinated action, and emotion. In this sense, theory of mind research is similar to our previous account of social cognition in that it includes research on the cognitive mechanisms underlying human perception of the mental states of others. "Two or more people coordinate their actions in space and time" is defined as joint action.

Lastly, emotions are usually a result of a particular degree of arousal combined with a good or negative affective state. These three conceptions are, in fact, crucial to the current argument, and they are brought up periodically throughout the work. In addition to focusing on the three previously described dimensions—emotion, cooperative action, and theory of mind—SCAN research also examines these concepts as phases of social information processing. The phases span from more implicit and instinctive social cognitive processes to explicit and managed ones. In fact, SCAN broadly supports the idea that social cognitive processes originate in these ways, as does many cognitive research. Before going into depth about how SCAN is used to research on human-machine systems, it is vital to correctly place the field of SCAN, even though comprehending the steps of social information processing as such are important.

In addition to focusing on the three previously described dimensions—emotion, cooperative action, and theory of mind—SCAN research also examines these concepts as phases in the social information processing process. The phases span from more implicit and instinctive social cognitive processes to explicit and managed ones.

In fact, SCAN provides strong evidence—as does a large body of cognitive research—that social cognitive processes develop in these manners. Before going into depth about how SCAN is used to research on human-machine systems, it is vital to correctly place the field of SCAN, even though comprehending the steps of social information processing as such are important.

SCAN has changed recently as a result of significant criticisms levelled at the field. A significant portion of SCAN research has focused on the social cognitive processes of people who are passively observing social stimuli (such as watching a video of a conversation). In contrast, the field's definition attempts to draw conclusions about social interactions that involve at least two people actively exchanging social information (such as having a conversation), if not more. This distinction is crucial because, in part due to the limits of neuroimaging techniques, it has long been customary in SCAN to undertake research on social processes in isolation. The important point is that this might produce findings and interpretations of social cognitive and affective processes that are essentially exclusive to an individual or, at the very least, not consistent with genuine interpersonal contact. According to data presented in more recent work, studies on those social phenomena in the setting of two or more people having real interactions would yield different findings than those on their own.

At least when compared to isolated experiments where participants passively judge social inputs, it is evident that a wider range of cognitive processes are involved during real social contact. It is only in the last several years that this SCAN limitation has started to appear in more and more books. For instance, Schilbach et al offered a rather comprehensive framework for studying real-world social interaction in SCAN in what they referred to as second-person neuroscience. They do this by drawing the "experimental landscape" for SCAN along the dimensions of participation in interaction, engagement in the interaction, and the number of individuals involved. In fact, their description is fairly similar to the definition of actual social interaction that was previously described.

Ultimately, interaction-based approaches to SCAN need to mature if SCAN is to be of significant use to research and development (R&D) of novel human–machine systems. Specifically, SCAN's utility will increase from basic to applied research as it evaluates and describes how people interpret one another's emotions, assign mental

states to others (theory of mind), and choose which behaviours to display during the interaction (joint action). In a nutshell, SCAN is relevant to the research and development of human-machine systems because it enhances our understanding of behavioural and neurological dynamics at the individual, group, and team levels in addition to the social cognitive and affective components.

Through its methodical investigation of social, cognitive, and neurological domains; research on emotions, cooperative behaviour, and theory of mind; and explanation of diverse phases of social information processing, SCAN is able to disseminate such knowledge. This paper's goal is to show how such knowledge can be used to progress the creation of next human-machine systems. The SCAN aspects are discussed only in relation to emotions for training and learning, theory of mind for HRI, and joint action for team performance in each of the following sample applications. In this way, we restrict our discussion to a range of applications; nonetheless, a systematic collection of research questions covering all three SCAN dimensions is suggested at the end of each section.

3.4ADVANCES IN SOCIAL COGNITIVE AND AFFECTIVE NEUROSCIENCE

Within the field of Social Cognitive and Affective Neuroscience, scholars utilize an array of techniques to tackle theoretical and applied inquiries that center on the complex interplay among social perception, cognition, and emotion in a range of contexts and populations. Using behavioral and brain data from both clinical groups and healthy individuals, they aim to investigate the intricacies of human behavior and elucidate its neuronal foundations. We are pleased to present a selection of ten highly referenced publications that have been published in Brain Sciences throughout the last two years, as proponents of open access to knowledge. These studies are representative of contemporary efforts that have covered a wide range of topics in this discipline and have provided insightful information about the numerous facets of human emotion, cognition, and social behavior.

1. Understanding Trauma and Attachment

A overview of the state of the art regarding the connection between attachment and trauma in developmental psychopathology was presented by Fonagy, Campbell, and Luyten.In addition to examining recent neuroscience findings on mentalization and trauma and presenting implications for clinical practice, their article investigated

significant difficulties in attachment theory addressing the impact of trauma and its transmission across generations. They provide light on the complex relationships between early attachment experiences and trauma reactions by fusing neurobiological viewpoints, which helps to shape our knowledge of developmental psychopathology.

2. Exploring Cognitive Interventions in Psychiatric Disorders.

The effectiveness of cognitive remediation and physical exercise, both alone and in combination, as therapies for cognitive impairment in schizophrenia was studied by Deste et al. [6]. In their publications, they reviewed seven research that combined physical exercise with cognitive remediation, and they pooled the results of nine meta-analyses and systematic reviews on physical exercise alone. This critical evaluation emphasizes the proven benefits of physical exercise for enhancing cognitive function in individuals with schizophrenia and contends that integrated therapies are more effective. It also highlights the need for more study to enhance the delivery of interventions and investigate long-term impacts that will influence the development of future psychiatric rehabilitation techniques.

3. Unveiling Neurobiological Mechanisms in Clinical Conditions

Neurovegetative activation in women with Functional Hypothalamic Amenorrhea (FHA) was studied by Pruneti and Guidotti [7]. Their investigation into the physiological and psychological aspects of this illness involved a comparison of 25 women with FHA to a control group. The study found autonomic hyperactivation and psychological discomfort in FHA patients by psychometric measures and the Psychophysiological Stress Profile (PSP). These results underscore the complex interactions of stress, mental health, and reproductive health, underscoring the necessity of multidisciplinary therapies and thorough assessment in the management of FHA.

4. Adapting to New Norms Amidst a Pandemic

Biggio et al.'s study [8] looked at how mask wear affected social space during the COVID-19 pandemic. Their study found that interpersonal space was larger between people who were not wearing masks through the use of reaching-comfort distance estimate tasks using avatars with and without masks. These findings allude to the psychological effects of preventive measures on social conduct by indicating a contextual adaptation of interpersonal space in response to pandemic-related norms.

5. Investigating Sensory Processing and Dysfunction

The association between olfactory bulb (OB) morphology and olfactory function was investigated by Yan et al. [9]. They showed that patients with olfactory problems had a higher frequency of non-convex OB patterns using both MRI scans and olfactory testing. These results show that OB shape may be a biomarker for olfactory dysfunction, providing diagnostic information about olfactory diseases.

6. Enhancing Cognitive Function through Physical Activity

A review of research using randomized controlled trials (RCTs) to evaluate the impact of cognitively engaging physical activity (PA) interventions on executive functions (EFs) in children ages 4 to 12 was carried out by Song et al. [10]. Following PA interventions, they found improvements in total EFs, updating, and shifting abilities based on their analysis of data from 11 papers. The convergent findings highlight how well these interventions work to improve EFs, especially updating and shifting, and how crucial it is to incorporate physical activity into early childhood education.

7. Promoting Cognitive Health in Aging

Yamasaki's review article [11] addressed the factors behind the efficaciousness of aerobic physical activity programs as preventive measures against dementia and cognitive decline. The review emphasizes the better preventive effects of aerobic physical activity and open-skill exercise on cognitive function. The body of research demonstrates that physical activity interventions are a non-pharmaceutical means of helping older persons maintain their cognitive capacities.

8. Investigating Neural Correlates of Affective Processes

In order to confirm the four-stage model of humor processing, Chang, Chan, and Chen's [12] functional magnetic resonance imaging (fMRI) study sought to understand the brain mechanisms underlying comedy enjoyment. Their research suggested including the expectation stage in the current paradigm and found the brain areas linked to each stage. These results advance our knowledge of the areas of the brain and the mechanisms behind affective neuroscience humor processing.

9. Addressing Complex Comorbidities in Neurological Disorders

Palermo et al. [13] looked into the relationship between frailty, SARSCoV-2 infection, and Parkinson's disease (PD). They suggested a multifaceted screening process to find people who are vulnerable. The findings demonstrated the value of multidisciplinary treatment in the management of multiple comorbidities and pointed to hypovitaminosis D as a possible connection between frailty, COVID-19, and the

progression of Parkinson's disease. This work highlights the need for early detection and intervention techniques and offers insights into the mechanisms underpinning the course of the disease.

10. Exploring Emotion and Creativity through Music

Using EEG recordings, Ramirez-Melendez and Reija [14] investigated the emotional aspects of creative drumming. This study discovered elevated pleasant feelings during pattern-based and free improvisation by examining arousal and valence levels at various levels of creative music performance. These results speak to the therapeutic potential of music-based therapies and music teaching by indicating a relationship between pleasant feeling and creative expression through drumming.

All things considered, these ten articles highlight some of the developing and new trends in the field [15]. In order to better understand the dynamic connections in the brain networks and areas associated with social cognition and emotion regulation, neuroimaging researchers are progressively turning to multimodal and multidisciplinary methodologies [16]. The development and improvement of psychotherapy therapies, which help control neural activity in the crucial brain networks involved in the social cognitive and affective processes, have been greatly influenced and informed by clinical and translational research [17]. Understanding the lifelong development of social cognitive and affective processes is of great interest [18]. This involves researching the ways in which early social experiences influence the brain circuits that underpin decision-making, empathy, social interaction, and theory of mind. Because they can provide mechanical insights into social information processing, such as mentalizing—that is, determining the intents and ideas of others—and social learning, computational models are becoming more and more popular [19]. Investigating cultural and contextual influences on emotion cognition and social behavior has also been the focus of some recent initiatives [20]. Understanding and treating mental diseases such autism spectrum disorder, schizophrenia, dementia, and mood disorders—disorders marked by social cognitive and effective deficits—will be significantly impacted by these new developments [21]. It is noteworthy to acknowledge that there exist an abundance of other exceptional and influential research works in this domain that have advanced our comprehension of the neural processes that underlie social cognition, emotion, and behavior.

We honor the collaborative efforts of researchers and the multidisciplinary approaches that are pushing the boundaries of knowledge in Social Cognitive and Affective Neuroscience by showcasing these highly cited articles in Brain Sciences that covered a wide range of topics, including attachment, mentalization, and trauma; cognitive function and psychiatric disorders with comorbidity conditions; neurobiology of sensory and music perception; social interaction and context-shaped behavior; cognitive development, and aging.

The new directions and trends in this field's changing terrain are nicely reflected in these publications. The door has been opened to creative interventions and comprehensive approaches to mental health and well-being by these results and critical viewpoints. We encourage readers to investigate these relatively recent additions as ardent supporters of open science and set off on a voyage of exploration to learn more about the complexities of the human mind and behavior.

Theoretical Framework on Brain Functions in Social Cognitive and Affective Neuroscience Social cognitive and affective neuroscience (SCAN) is a multidisciplinary field that seeks to understand how brain processes underpin social behavior and emotional experiences. This theoretical framework outlines the key concepts, brain regions, and processes involved in SCAN, providing a comprehensive understanding of how the brain supports social cognition and affective functioning.
The multidisciplinary discipline of social cognitive and affective neuroscience, or SCAN, investigates the brain mechanisms underlying emotional and social activities. In order to comprehend how the brain underpins intricate social actions and affective experiences, it integrates concepts and methods from psychology, neurology, and social sciences.

3.5 HISTORICAL BACKGROUND

Our understanding of how students learn, think, and feel in social circumstances has greatly progressed thanks to the studies of affective neuroscience and social cognitive neuroscience (SCN). These multidisciplinary disciplines combine cognitive science, psychology, and neuroscience to investigate the neurological underpinnings of social and emotional behavior. Pupils' historical history in these subjects offers a rich tapestry of scientific research and innovative technology. Building on the theories of

cognitive neuroscience and social psychology, social cognitive neuroscience first appeared in the latter half of the 20th century. When neuroimaging technologies like positron emission tomography (PET) and functional magnetic resonance imaging (fMRI) were developed in the 1960s and 1970s, the field of cognitive neuroscience—which studies the neurological underpinnings of mental processes—began to flourish. The real-time observation of brain activity made possible by these instruments gave researchers previously unheard-of insights into the functioning of the human mind.

In contrast, social psychology has a lengthier history that dates back to the early 20th century. It focuses on how the social environment affects people's ideas, feelings, and behaviors. The realization that social interactions and cognitive processes are intricately linked sparked the beginning of the integration of these two fields in the 1990s. It was made possible by scientists like John Cacioppo and Gary G. Berntson that SCN become recognized as a separate field. They promoted an interdisciplinary approach that brought together the ideas and instruments of cognitive neuroscience with the theories and practices of social psychology.

SCN is strongly associated with affective neuroscience, which focuses on the neurological underpinnings of emotion. Due in large part to prior research on the limbic system of the brain, which is essential for processing emotions, this discipline also started to acquire popularity in the late 20th century. Pioneers in the field of understanding how emotions are represented and regulated in the brain include researchers like Jaak Panksepp and Joseph LeDoux. Their research paved the way for our current knowledge of the relationship between emotion and cognition, which is especially important in the context of education.

The use of emotional neuroscience and SCN in education has shed important light on how students engage and learn in social settings. Studies, for instance, have demonstrated the profound effects that social elements have on students' cognitive and emotional health, including peer relationships, teacher-student relationships, and classroom atmosphere. The prefrontal cortex and the amygdala have been shown through neuroimaging research to be important brain regions in these processes, underscoring the significance of executive functioning and emotional regulation for academic performance.

Furthermore, studies in these domains have illuminated the neurological underpinnings of social cognition, encompassing functions like empathy, perspective-taking, and social decision-making. These skills are essential for collaborative learning and successful learning in educational environments. For instance, certain neural circuits involving the medial prefrontal cortex and the temporoparietal junction have been related to the formation of theory of mind, or the capacity to comprehend the mental states of others. Comprehending these neurological pathways facilitates educators in creating interventions that encourage children to engage in social and emotional learning (SEL).

Technological developments and methodological advances have also contributed to the emergence of social cognitive and affective neuroscience. With the use of high-resolution imaging methods like electroencephalography (EEG) and fMRI, scientists are now able to investigate the spatial localization and temporal dynamics of brain activity linked to social and emotional processes. Furthermore, new methods for analyzing complex data have been made possible by computer modeling and machine learning, which have produced more nuanced understandings of how students' brains behave in social situations.

At the nexus of SCN, affective neuroscience, and education has developed the emerging subfield of educational neuroscience. The goal of this multidisciplinary approach is to convert neuroscientific discoveries into useful teaching and learning techniques. For instance, SCN research has been used to inform the development of therapies aimed at improving students' academic motivation, emotional control, and social skills. It has been demonstrated that SEL-integrated programs enhance children' academic achievement, lessen behavioral issues, and foster constructive social behaviors.

Moreover, the significance of individual differences has been emphasized by the incorporation of SCN and emotional neuroscience into educational research. Students differ from one another in terms of their social behaviors, emotional reactions, and cognitive capacities due to a variety of environmental, genetic, and life experiences. Teachers can adapt their teaching strategies to fit the various requirements of their pupils by having a better understanding of these variances at the brain level. Personalized learning plans that consider the social and emotional profiles of students, for example, can promote a more welcoming and encouraging learning environment.

A increasing focus on the useful applications of SCN and emotional neuroscience in teaching has emerged in recent years. To create evidence-based strategies that improve teaching and learning outcomes, educators and researchers are working together. As a result of these partnerships, teacher training programs have been developed with the goal of raising teachers' awareness of the neurological foundations of social and emotional development. Teachers can give their students more interesting and productive learning experiences by implementing neuroscientific ideas into their lesson plans.

In conclusion, our knowledge of students' learning and social interactions has been significantly impacted by the historical development of social cognitive and emotional neuroscience. With important ramifications for education, the merging of these domains has yielded insightful information on the brain processes behind social cognition and emotion. Research in affective neuroscience and SCN has the potential to advance teaching strategies and raise student achievement as it develops. With the rich insights these interdisciplinary fields have to offer, it is likely that the social and emotional aspects of learning will receive more attention in the future of education.

3.6 KEY CONCEPTS

The neural foundations of emotional and social behavior are the main focus of the discipline of social cognitive and affective neuroscience, or SCAN. There are a number of important ideas in this field that students must comprehend. The study of social cognition encompasses understanding and communicating with others. Theory of Mind (ToM), social perception, empathy, and social decision-making are some of the key areas of study. Theory of Mind is the ability to attribute mental states to oneself and other people, whereas social perception is the ability to identify and decipher nonverbal signs like facial expressions and body language. Social decision-making refers to how people make decisions about what to do in social situations by taking reciprocity and justice into account. Empathy is the capacity to recognize and experience another person's feelings.

Another important field of study is affective neuroscience, which looks at the neural mechanisms behind emotion. It focuses on emotion regulation, affective responses, motivation, and reward. Emotion regulation is the process by which individuals manage their emotions by using strategies to maintain, intensify, or decrease

emotional responses. The prefrontal cortex and amygdala in the brain regulate affective reactions, while motivation and reward deal with how the brain interprets rewards and how this influences behavior.

Affective neuroscience is a significant area of research that examines the brain underpinnings of emotion. It focuses on motivation, reward, affective reactions, and emotion management. The process by which people control their emotions by employing techniques to sustain, amplify, or diminish emotional reactions is known as emotion regulation. While motivation and reward deal with how the brain processes rewards and how this drives behavior, the prefrontal cortex and amygdala in the brain control affective reactions.

Adolescence is highlighted by developmental elements as a vital time when the brain undergoes major reorganization in order to build social cognitive capacities. It is also a critical time when social and emotional learning experiences have a big impact on the brain. The educational implications of SCAN center on integrating emotional literacy programs to improve emotional intelligence, understanding the impact of stress on learning, addressing the effects of social media and technology on social cognition and emotional well-being, and promoting social learning through cooperative and collaborative methods.

Research methods in this field include behavioral experiments to explore particular facets of social cognition and emotional processing, longitudinal studies to track changes over time, and neuroimaging techniques like electroencephalography (EEG) and functional magnetic resonance imaging (fMRI) to examine brain activity. Applications of SCAN include education, where research can improve social and emotional learning (SEL), and mental health, where insights can help comprehend diseases including autism, depression, and anxiety. Furthermore, via encouraging improved understanding and communication in both public and private contexts, SCAN research can strengthen interpersonal connections. In order to better understand emotive, cognitive, and social processes, SCAN must integrate knowledge from a variety of disciplines, including psychology, neurology, sociology, and education. It must also explain individual differences in social and emotional behavior. Finally, it must take advantage of technological advancements. Understanding these ideas can help educators and researchers better support the social

and emotional growth of their pupils, which will improve learning and general wellbeing.

3.7 MAJOR BRAIN REGIONS IN SCAN

Social cognitive and affective neuroscience (SCAN) studies how the brain processes emotional and social cues, activating different brain regions that have varied effects on how people see, understand, and respond to these cues. The prefrontal cortex (PFC), which is divided into regions with distinct functions, is a major actor in this domain. Theory of mind, or the ability to comprehend the thoughts of others, self-referential processing, and social decision making all depend on the medial prefrontal cortex (mPFC). Through the ability to anticipate and interpret the thoughts and feelings of those around them, people in this area are able to manage complex social interactions. Another important component of the PFC is the orbitofrontal cortex (OFC), which is engaged in processing rewards and punishments, making decisions, and analyzing social and emotional cues. This area aids in assessing the effects of actions and modifying behavior in response to emotional and social cues. Furthermore, executive processes like working memory and cognitive flexibility—which are necessary for adjusting to social settings and handling interpersonal tasks—are supported by the dorsolateral prefrontal cortex (dlPFC).

The anterior cingulate cortex (ACC) is essential for error detection, mood regulation, and performance monitoring. Empathy and the ability to feel both bodily and social sorrow depend on it. This area promotes empathy and socially adapted behavior by enabling people to comprehend and react to upsetting social events. Another important portion of the brain that is critical for controlling emotions, especially anger and fear, is the amygdala. It helps people recognize emotional facial expressions and is involved in emotional learning and memory. These abilities allow people to react correctly to social cues and possible dangers.

Theory of mind, perspective taking, and the ability to comprehend the intents of others all depend on the temporoparietal junction (TPJ). It combines internal feelings with outside data so people may understand and anticipate the intents and behaviors of others, which is essential for productive social interactions. The insula facilitates a greater knowledge of one's own and other people's emotional responses by assisting

individuals in recognizing and interpreting their own internal bodily sensations. It is linked to interoceptive awareness, empathy, and the subjective experience of emotions.

The posterior superior temporal sulcus (PSTS), which is involved in identifying biological motion, determining gaze direction, and interpreting the intents and actions of others, is another important region. This field is critical for deciphering dynamic social cues, which are vital for comprehending nonverbal communication and social interactions. Examples of these cues include body language and eye movements. The creation and retrieval of memories, especially those pertaining to emotional experiences and social situations, are largely linked to the hippocampus. This area improves social cognition and emotional intelligence by assisting people in applying lessons learned from previous social interactions to present interactions.

Social behaviors and the formation of social bonds depend on the basal ganglia, which process rewards and are engaged in motivation. These social structures impact the inclination to interact with people and establish relationships, which supports behaviors that are necessary for cooperation and social bonding. Last but not least, the fusiform gyrus is essential for identifying faces and interpreting social cues from them. This field focuses on facial recognition and processing, allowing people to read and react to social cues expressed by their facial expressions.

In conclusion, the intricate processes of affective neuroscience and social cognition are driven by the interaction of these several brain regions. With its divisions, the prefrontal cortex supports the executive processes, self-referential thought, and decision-making required for social interactions. The amygdala and anterior cingulate cortex are involved in emotional control, empathy, and social cue recognition. Perspective-taking, empathy, and the understanding of internal and external states are supported by the temporoparietal junction and insula. The hippocampus is essential for the generation and retrieval of memories pertaining to social situations, whereas the posterior superior temporal sulcus assists in the perception of dynamic social cues. The fusiform gyrus is crucial for facial recognition and social cue interpretation, whereas the basal ganglia impact motivation and reward processing, propelling social activities. When combined, these areas create a network that helps people interact with others in meaningful ways, navigate the social world, and comprehend and react to their intentions and feelings. The intricacy and sophistication of the human brain in

regulating social relationships are highlighted by an understanding of the functioning of various brain regions, which offers insight into the neurological foundations of social behavior and emotional processing.

3.8 APPLICATIONS AMONG STUDENTS

Significant gains can be obtained in a number of domains, including social engagement, emotional regulation, empathy and moral development, learning and memory, and mental health, by incorporating brain region studies into educational and developmental psychology. Teachers and psychologists can design rich learning environments that support students' overall development if they have a thorough understanding of these fields.

First and foremost, social interaction and peer relationships are vital components of a child's growth. Comprehending the brain areas implicated in social dynamics, like the amygdala and prefrontal cortex, can greatly enhance the way psychologists and educators approach the development of social skills. The amygdala is crucial for processing emotions, such as fear and pleasure, whereas the prefrontal cortex is necessary for making decisions and regulating social behavior. Educational programs can be created to improve students' social abilities, which will promote stronger peer connections and societal cohesion, by utilizing knowledge into how certain brain regions affect social interactions. This knowledge aids in the development of interventions that encourage constructive social connections, lessen bullying and social isolation, and eventually create a school climate that is more welcoming and encouraging.

Another crucial area where understanding certain brain regions can have a revolutionary effect is emotional control. Academic achievement and general well-being depend heavily on one's capacity to control stress, worry, and other emotions. Two brain areas related to controlling emotions include the insula and the anterior cingulate cortex. The insula is essential for self-awareness and emotional experiences, whereas the anterior cingulate cortex is engaged in emotional processing and cognitive regulation. Teachers who possess this expertise are better able to instruct kids in stress management and productive coping strategies. For example, the curriculum can include cognitive-behavioral techniques and mindfulness exercises to assist students better manage their emotions. This improves their academic

achievement and equips them with the resilience they will need to face obstacles in the future.

Brain function also plays a key role in the development of empathy and morality, especially in the mirror neuron system and the ventromedial prefrontal cortex. Social learning is greatly aided by the mirror neuron system, which enables people to comprehend and sympathize with the feelings and behaviors of others. Making moral and ethical decisions, as well as processing risk and fear, are processes that are mediated by the ventromedial prefrontal cortex. Teachers may develop a student body that is more morally sound and empathetic by supporting programs that foster moral judgment and empathy. Programs that incorporate the principles of socio-emotional learning (SEL), which emphasize the development of social skills, empathy, and moral behavior, have the potential to be very successful. These initiatives may result in a more sympathetic learning environment where students are better equipped to make moral decisions and demonstrate empathy for others.

Another area where brain research is useful is the link among learning, memory, and emotional states. Emotional moods affect the prefrontal cortex, which is involved in working memory and cognitive flexibility, and the hippocampus, which is crucial for creating new memories. These brain regions can become dysfunctional due to stress and unpleasant emotions, which can impact memory and learning. By being aware of this relationship, educators can develop teaching strategies that lessen the detrimental effects of stress on learning. For instance, allowing for breaks, creating a happy learning atmosphere, and teaching students how to control their emotions can all help them learn and remember material better. Furthermore, by acknowledging that varying emotional states can either promote or impede learning, teachers can adapt their pedagogical approaches to enhance students' emotional health and enhance their academic performance.

Another important area in educational psychology that gains from the use of brain region studies is mental health. Adolescents frequently struggle with emotional and social issues, like social anxiety and depression, which can have a big impact on their success in school and in other social situations. These mental health problems are strongly correlated with brain areas such as the prefrontal cortex and the amygdala. It is commonly known that the prefrontal cortex controls emotions and behavior, and the

amygdala processes fear and anxiety. Teachers and psychologists can act more successfully if they are able to identify the early indicators of mental health problems and comprehend the underlying brain mechanisms. Students can receive focused support from school-based mental health programs that take into account understanding of these brain regions. This could include peer support groups, stress management classes, and counseling services to assist students in overcoming their emotional obstacles. For students' total growth to be supported, a supportive learning environment that attends to their emotional and cognitive needs must be established.

Social, Cognitive, and Affective Neuroscience (SCAN) research discoveries can greatly improve students' academic and social success when included into instructional approaches. Teachers and psychologists can better fulfill the varying requirements of their pupils if they have an understanding of how different brain regions effect learning and development. For example, learning outcomes can be improved and academic pressure can be reduced using interventions developed with an understanding of how stress affects the brain. In a similar vein, initiatives to improve social skills and emotional control can result in a more upbeat learning environment where students are encouraged and respected.
All things considered, the use of brain area research in developmental psychology and education could completely change the way that learning is imparted. Through a focus on social engagement, emotional regulation, moral growth and empathy, memory and learning, and mental health, educators and psychologists can establish learning environments that support students' total well-being in addition to encouraging academic brilliance. By providing children with the tools they need to succeed academically and personally, this all-encompassing approach paves the way for a generation that is more resilient, empathic, and successful.

3.9 METHODS AND TECHNIQUES

The study of the neurological underpinnings of social and affective processes is done by the multidisciplinary field of social cognitive and affective neuroscience (SCAN). The ways in which children's behavior and learning are influenced by social interactions, emotions, and cognitive processes are clarified by SCAN techniques and procedures. Functional Magnetic Resonance Imaging (fMRI) is a crucial component of the SCAN approach. It measures brain activity by identifying changes in blood flow, which enables researchers to pinpoint the areas of the brain involved in

particular tasks. Using fMRI, researchers can look at how students read social cues—such as the intentions or feelings of others—investigate the neural bases of social decision-making, peer pressure, and empathy, and map out the areas of the brain linked to stress and anxiety in relation to academic success. Electroencephalography (EEG), which records electrical activity in the brain using scalp sensors to offer information on brain wave patterns, is another essential method. EEG is used to study the relationship between feedback, student performance, and brain processes of learning. It is also used to measure changes in brain activity resulting from social cues or classroom circumstances. Finally, it is used to assess the timing of brain processes related to emotions, memory, and attention.

Derived from EEG data, event-related potentials (ERPs) are brain responses that are closely linked to certain motor, cognitive, or sensory events. ERPs are used to examine how students understand feedback, rewards, and errors; how the brain processes attention and how that affects learning and performance; and how the brain reacts to social inclusion or exclusion. By using near-infrared light to track variations in blood oxygenation levels, Functional Near-Infrared Spectroscopy (fNIRS) measures brain activity. FNIRS is especially helpful for researching how the brain works in natural settings such as schools, how group dynamics affect cooperative learning, and how student social interactions affect brain activity patterns.

A key component of SCAN is the use of neuropsychological assessments, which are standardized exams or exercises designed to gauge cognitive abilities connected to certain brain regions. These tests assist in determining how social and emotional factors impact cognitive performance, evaluate executive functioning in relation to academic activities, such as working memory and inhibitory control, and identify the impact of emotions on the ability to solve problems and make decisions. Measurements of hormones, such as cortisol related to stress and oxytocin associated to social bonding, shed light on the physiological aspects of social and emotional processes. These assessments are used to look at the connection between stress and academic performance, the function of oxytocin in social interactions and cooperative learning, and the impact of hormone changes on motivation and involvement in learning activities.

Eye-tracking technology provides important insights into attention and information processing by recording the position and length of a person's gaze on a variety of stimuli. This method can be used to track the relationship between eye movements and learning content comprehension, study how students distribute their visual attention during educational tasks, and investigate the impact of social cues like facial expressions on attention. Behavioral experiments are closely watched studies that are intended to measure particular aspects of social and cognitive behavior. They are carried out to examine how students interpret and respond to social criticism, how they make decisions in social contexts such as peer pressure or teamwork, and how social pressures impact learning outcomes and cognitive function.

Computational modeling is the practice of simulating neurological processes and forecasting how different circumstances will affect behavior and brain function. This method is used to create social learning models, predict how students learn from their peers, model how emotions impact decision-making, and comprehend the neural underpinnings of individual variations in social cognition and emotional regulation. Studies that track people over time, known as longitudinal studies, shed light on how behavioral and brain changes take place. These studies monitor how a student's cognitive and social skills develop over the course of their schooling, look into the long-term impacts of early social experiences on emotional and academic performance, and assess the results of interventions designed to improve social and emotional learning.

Researchers frequently use integration and multimodal approaches to get a thorough grasp of students' social-cognitive and affective processes. For example, fMRI and behavioral research can be combined to associate brain activity with particular social behaviors, and neuroimaging and hormone measurements can be combined to reveal the physiological mechanisms underpinning social interactions. SCAN researchers can provide light on the complex interplay between social, cognitive, and emotional processes in learning contexts by employing various methodologies and approaches. This in turn offers helpful advice for raising pupils' general wellbeing and academic achievement.

Designing successful teaching tactics and interventions in the educational setting requires a deeper understanding of how students process social and emotional

information, which is made possible by utilizing SCAN methodologies. For instance, fMRI research may show that when students participate in cooperative learning activities, specific brain regions are more active, indicating the significance of collaborative settings for improving academic achievement. Teachers can modify their teaching strategies to keep students engaged by using EEG and ERPs, which can identify precisely when a student's attention is waning. Real-time brain activity monitoring in the classroom using FNIRS allows for quick feedback on how various teaching philosophies or classroom dynamics affect student learning.

Additionally, neuropsychological evaluations can pinpoint kids who could experience difficulties with particular cognitive abilities, such working memory or inhibitory control, which are critical for success in the classroom. Teachers can better serve these pupils by customizing their methods based on their understanding of these shortcomings. An additional level of understanding is provided by hormonal measurements, which show how social bonding hormones such as oxytocin and cortisol, or stress, affect social interactions and learning. This information can help design programs that improve social connection and lower stress levels in the classroom, which will improve student performance.

Research using eye tracking can assist teachers in comprehending how students interact with instructional materials and what draws their attention. With this knowledge, more useful visual aids and educational materials that fit students' natural viewing styles can be created. Behavioral experiments can be used to model classroom environments in order to investigate the effects of various teaching strategies or social dynamics on student behavior and learning. Researchers can test theories and create evidence-based plans for enhancing instructional practices with this experimental technique.

A useful method for forecasting potential effects on student learning and behavior is computational modeling, which can be applied to social situations or instructional strategies. These models are capable of simulating a range of scenarios and providing insights into the best methods for varying learner types. When it comes to comprehending the long-term effects of early educational experiences and treatments, longitudinal studies are very helpful. Through longitudinal student tracking,

researchers can determine the long-term impacts of various instructional strategies, social contexts, and educational initiatives.

A comprehensive understanding of the intricate interactions between social, cognitive, and affective processes in education is provided by the combination of several SCAN approaches. For example, the simultaneous influence of social interactions on stress levels and brain activity can be revealed by fMRI combined with hormone measurements. This multimodal approach offers a more thorough comprehension of the ways in which different factors interact to influence behavior and learning.

In the end, the knowledge gathered from SCAN study can help create educational interventions and policies that are more successful. Teachers may design learning environments that meet the cognitive and emotional needs of every student by having a thorough understanding of the neurological and physiological underpinnings of learning. This all-encompassing method not only helps kids achieve better academically but also supports their general well-being, setting them up for success in both their personal and academic life. Applications of SCAN research in education are expected to grow as it develops further, providing fresh chances to enhance student learning and meet a variety of demands.

3.10 APPLICATIONS

Investigating the brain mechanisms governing social interactions, emotions, and cognitive functions is the focus of the multidisciplinary discipline of social cognitive and affective neuroscience (SCAN). SCAN is used with kids in a variety of educational and developmental contexts, providing insights that help improve learning, emotional control, social skills, and general wellbeing. Here are a few thorough applications:

1.Enhancing Learning and Memory

Neural Basis of Learning: Developing more efficient teaching strategies can be aided by knowledge of the various ways that distinct brain regions play a role in learning. For example, the prefrontal cortex plays a critical role in executive functions such as planning and decision-making, which are essential for tasks involving problem-solving. Emotional Impact on Learning: Emotions have a big impact on recall and memory retention. Stress-reduction methods like mindfulness or cognitive-behavioral

approaches can enhance academic performance by fostering the ideal emotional environment tfor learning.

2.Improving Emotional Regulation

Emotion Recognition and Processing: Emotional intelligence can be raised through educational initiatives that strengthen students' capacity to identify and manage emotions. According to neuroimaging research, emotional control can be enhanced by engaging in activities that target the prefrontal cortex and amygdala.

Meditation and mindfulness: Research has shown that techniques like mindfulness meditation can change the anterior cingulate cortex, a part of the brain that regulates emotions, which can help students better control their stress and anxiety.

3.Developing Social Skills

Theory of Mind and Empathy: SCAN research can assist with initiatives that foster empathy and the theory of mind, or the comprehension of other people's points of view. Improving these abilities is connected to improved social interactions and is related to the temporoparietal junction and medial prefrontal cortex neural networks. Social Feedback and Behavior: Interventions aimed at enhancing students' social resilience and lessening the effects of unfavorable social experiences can be better informed by an understanding of how the brain interprets social feedback, such as acceptance or rejection.

4.Supporting Mental Health

Early Mental Health Issue Detection: SCAN instruments such as neuroimaging can be used to find early indicators of mental health conditions including anxiety and depression. The implementation of mental health programs in schools can help to facilitate early intervention. Neurofeedback and Interventions: Students who struggle with attention difficulties, anxiety, and other common issues can benefit from techniques like neurofeedback, which teaches people how to control their brain activity.

5.Personalized Education

Adaptive Learning Technologies: SCAN insights can guide the creation of adaptive learning technologies that customize course material to each student's unique

requirements and cognitive profile. For instance, knowing how a student's brain reacts to various kinds of information might assist in developing individualized lesson plans. Cognitive Training Programs: Neuroscience research can provide a solid foundation for programs aimed at improving particular cognitive abilities, like working memory or attention, so they can effectively target the relevant brain regions.

6.Promoting Inclusive Education

Gaining a Better Understanding of Neurodiversity: SCAN can help with a deeper comprehension of neurodevelopmental diseases like ADHD and autism. With this information, educational settings that are more inclusive and meet the requirements of a variety of learners can be developed.

Social Inclusion Programs: SCAN insights can be used to build programs that promote inclusion and lessen stigma related to mental health or neurodevelopmental problems.

7.Enhancing Creativity and Innovation

Brain Networks and Creativity: Educational strategies that promote creative thinking can benefit from an understanding of the neurological underpinnings of creativity. Promoting exercises that activate the executive control network and default mode network (DMN), for example, can improve the ability to solve problems creatively. Encouraging distinct Thinking: Teachers can create activities that encourage creativity and critical thinking by having a better understanding of how various brain networks interact to support distinct thinking styles.

8.Technological Integration

Use of Virtual Reality (VR): SCAN research has led to the development of VR technologies that can be used to build immersive learning environments that more successfully engage students' social and cognitive capabilities.

Biofeedback Tools: Students can develop self-regulation skills that improve focus and lower stress levels by using tools that offer real-time feedback on physiological and brain conditions.

The integration of SCAN results into pedagogical approaches helps establish a more

comprehensive and efficient learning environment that fosters students' social, emotional, and cognitive growth.

3.11 CHALLENGES AND FUTURE DIRECTIONS

In order to comprehend how brain processes, underpin social interactions and emotional experiences, the interdisciplinary area of social cognitive and affective neuroscience (SCAN) integrates knowledge from social science, psychology, and neuroscience. There are various issues and potential avenues for future research among students, both as subjects and as prospective researchers:

1.Complexity of Multidisciplinary Integration:
Methodological challenges may arise when integrating neuroscience tools (such as fMRI and EEG) with psychology and social science approaches (such as behavioral trials and surveys).
Instruction: Pupils must receive thorough instruction in a variety of subject areas, which can take a lot of time and resources.

2.Ethical Concerns:
Privacy: There are serious privacy concerns with neuroimaging and other biometric data collecting.
Informed Consent: It's important—and often difficult—to make sure that participants, particularly students, are fully aware of what their involvement involves.

3.Technological Limitations:
Accessibility: Students may not have easy access to the necessary tools due to high costs and restricted availability of modern neuroimaging equipment.
Data Complexity: Students may find it difficult to work with the huge and complex datasets created since they demand sophisticated computing and statistical knowledge.

4.Replication Crisis:
Reproducibility: SCAN is not an exception when it comes to the importance of making sure that results can be repeated in psychology and neuroscience.
Generalizability: A lot of research employ homogeneous, small samples—typically undergraduate students—which can restrict how broadly the findings can be applied.
5. Rapidly Evolving Field:

Keeping Up: Students may find it challenging to stay up to date due to the rapid advancements in technology and methods.
Curriculum Development: It may be difficult for educational programs to keep their curricula up to date with the most recent advancements.

3.12 FUTURE DIRECTIONS

The development of social cognition and affective neuroscience depends more and more on interdisciplinary training programs (SCAN). The creation of enhanced curriculum that incorporate thorough instruction in the social sciences, psychology, and neuroscience is a crucial component of this progression. Students and researchers can gain an understanding of the intricate interactions among brain functioning, social behaviors, and emotional processes through these interdisciplinary courses. By connecting different fields, the courses promote a more comprehensive comprehension of human behavior and give aspiring researchers the varied skill sets required to address complex issues. Aside from providing specialized training, the increasing number of workshops and seminars also gives attendees the chance to interact with industry professionals, learn about the most recent developments, and delve deeper into certain SCAN topics. These training programs guarantee that SCAN remains at the forefront for both novice and seasoned researchers.

Another factor propelling the development of SCAN is technological advancements. The advancement of affordable and portable neuroimaging instruments is noteworthy. Due to their high cost and immobility, traditional neuroimaging tools like fMRI and PET scanners are inaccessible to many subjects and researchers. On the other hand, more recent and reasonably priced equipment can be employed in different contexts, enabling a wider range of investigations and increasing the inclusivity of neuroimaging research. Furthermore, handling big, complicated datasets has been completely transformed by the development of sophisticated data analysis tools, especially those that make use of artificial intelligence (AI) and machine learning. These tools provide a more comprehensive knowledge of the brain's participation in social and affective processes by revealing patterns and insights that traditional analysis approaches could miss. Researchers are therefore able to make more precise inferences and create interventions that work better.

In SCAN research, ethical issues are crucial, which makes the creation of strong frameworks to direct researchers necessary. Enforcing strict guidelines designed especially for SCAN guarantees that research is carried out in an ethical and responsible manner. These guidelines support both participant safety and research integrity. Participant education, or improving processes to guarantee that participants are fully informed about the nature of the study and give genuinely informed permission, is a critical feature of these ethical frameworks. Enhancing these procedures helps researchers cultivate participant collaboration and confidence, which is critical to the ethical viability and success of SCAN studies.

Research networks that collaborate have become essential to the advancement of SCAN. Consortia and database creation makes it easier to share information and resources, resulting in the development of large, collaborative research networks. Through these partnerships, scientists from various academic institutions and fields can collaborate, combining their knowledge and resources to address challenging research issues. Large-scale, multi-site research's dependability and generalizability are further improved via crowdsourcing. Through conducting research in a variety of demographics and environments, scientists can make sure that their findings are reliable and transferable to a broad range of situations. The impact of SCAN research is increased and the pace of discovery is accelerated by this collaborative method.

In order to guarantee that the results of SCAN research are representative and appropriate to the broader population, variety must be emphasized. Choosing study participants who are representative of the community at large is a key component of inclusive research techniques. By identifying the ways in which social and affective processes change among various demographic groups, this inclusion contributes to the development of more thorough and equitable insights. Furthermore, cultural sensitivity is crucial for both research design and interpretation. Researchers can prevent biases and make sure their findings are applicable to and respectful of all cultural groups by considering cultural contexts. The focus on variety enhances SCAN research, increasing its precision and influence. Application-oriented research, which aims to translate discoveries into practical solutions that can benefit society, is becoming more and more important to SCAN. Translational study highlights the applicability of SCAN results in clinical, educational, and organizational contexts. By bridging the gap between basic research and real-world applications, translational

research can lead to the development of innovative therapies and interventions that enhance social functioning, mental health, and educational outcomes. For example, SCAN insights can direct the creation of educational programs that foster social and emotional development as well as therapeutic modalities for mental health conditions and the improvement of social skills. This application-focused approach ensures that SCAN research contributes meaningfully and favorably to society.

For SCAN research to be credible and reliable, replication procedures must be improved. Enhancing replicability is greatly aided by the open scientific movement, which advocates for the sharing of research techniques, data, and study preregistration. Data falsification and selective reporting are among the problems that open science aims to minimize by increasing transparency and accessibility of research procedures. Standardized protocols offer precise and uniform guidance for carrying out experiments, which further supports replication. These techniques aid in the precise replication of findings by researchers, bolstering the SCAN evidence foundation. Through the implementation of these enhanced replication procedures, the SCAN community may establish a more resilient and reliable corpus of knowledge.

In summary, there is a great deal of room for advancement in the fields of affective neuroscience and social cognition. The discipline will advance only with the help of interdisciplinary training programs, technical breakthroughs, ethical frameworks, collaborative research networks, diversity emphasis, application-oriented research, and enhanced replication techniques. Students and scholars can help to develop a more robust, moral, and inclusive field by actively pursuing these prospective courses and tackling pressing issues. There will be major societal benefits from this coordinated endeavor as we get a better knowledge of human behavior and emotion.

3.13 INFLUENCES AND IMPLICATIONS OF AFFECTIVE NEUROSCIENCE IN CHILDRENS LEARNING AND EDUCATION

Emotion is a mental, emotional, and physical condition that includes actions as well as thoughts. People can communicate their emotions and feelings through their body language and facial expressions. People go through a variety of emotions throughout their daily lives. More specifically, various environments and circumstances reflect variations in emotions. Emotions do, in fact, have a big influence on states of working or learning. Adults are typically able to effectively control and regulate their emotions

when working. Children and teenagers, however, might not be able to manage their emotions well enough. Put another way, their emotions have a greater tendency to direct and impact them. Cognition-related ideas, such as cognitive-developmental theory, have been extensively used in education throughout the past few decades. In contrast, emotional awareness and functions are typically disregarded in educational settings. Moreover, a lot of the processes involved in processing and modulating emotions are still developing in youngsters, thus their feelings differ from those of adults. Neurobiology, cognition, and social processing are also impacted by emotions, and this has a significant effect on how well kids learn. As a result, in learning environments, instructors must pay closer attention to how students are feeling.

3.14 INFLUENCE FACTORS IN CHILDRENS EMOTIONAL DEVELOPMENT

Every person's brain functions and changes throughout their lifetime. The fundamental job of the human brain, according to dynamic system theory (DST), is to maintain organismal equilibrium when reacting to changes in intrinsic and external stimuli. This indicates that throughout life, the human brain continues to function and change. Childhood, however, is a time of great and deep transformation. Children's and teens' brains are developing and very different from adults' brains in comparison. For instance, the number of synaptic connections between neurons peaks in infancy and subsequently declines, even though newborns and children have roughly the same number of neurons as adults (Mosier, 2013). Put another way, babies have the greatest amount of these synaptic connections, whereas adults have the fewest. Children's body regulation and sensation in processing and regulating emotions may differ from adults due to differences in neurobiology. "A positive relationship with the fusiform gyrus and a negative relationship with the ventromedial prefrontal cortex" are the two regions in which a whole-brain examination of emotional reactivity in people aged 10 to 22 revealed a linear effect of age (McRae et al. 2012). Regarding the control of emotions, they highlight "linear increases in activation with age in a left ventrolateral PFC region, the left inferior frontal gyrus."

3.15 THE INFLUENCE OF AFFECTIVE NEUOSCIENCE IN CHILDRENS LEARNING

One of the most important components of children's learning is emotion. According to affective neuroscience, experiencing emotions and responding to them during learning

triggers a chain of brain processes that affect how students internalize and absorb information. More specifically, learners can be guided to apply beneficial experience and skills to address problems by using the brain system of emotion as a rudder (Immordino-Yang & Damasio, 2015). Emotions help students recruit brain networks supporting experience and skills through regulation and stimulation of attention (Posner & Rothbart, 2005, cited in Immordin-Yang, 2011), motivation, and cognitive processing (Immordino-Yang, 2011). This means that emotions facilitate learning with neural changes.

Reasoning and decision-making are significantly impacted by emotions. Patients with ventromedial prefrontal cortex injury do not lose their ability to acquire new information, access existing knowledge, or use logic in thinking. They are hardly likely to choose well, though. More precisely, they are unable to make moral, social-cultural, or affective judgments about a problem. These skills are connected to affective neuroscience and emotional systems rather than intelligence quotient. According to Immordino-Yang & Damasio (2015), impairment of the ventromedial prefrontal cortex causes the loss of certain social emotions such as shame, guilt, and compassion, in addition to specific emotional reactions. These feelings can assist people in evoking the proper experience to think clearly and come to wise judgments. For instance, why are we aware that certain derogatory remarks are occasionally inappropriate to make in public? People would feel embarrassed if we spoke to them in public with such remarks.

Children's learning processes may be negatively impacted by negative emotions and emotional problems. Anxiety disorders may result from an increase in amygdala activation, according to recent research. Children who struggle with learning anxiety typically have focus issues. These kids have shorter attention spans than their peers, which causes behavioral issues during learning and hinders their ability to function successfully in the classroom (Goswami, 2006). On the other hand, a number of therapies can be used to treat learning anxiety. These kids can overcome their learning anxiety issues and improve their focus in class with some instruction. Furthermore, learning can be adversely affected by unpleasant emotions like worry and anxiety. If kids are experiencing stress and anxiety, they are not likely to learn effectively (Goswami,2006).

3.16 EMOTION AND COGNITION

One major area that is thought to affect children's learning is cognition. The methods of learning new information are typically explained through information processing, encoding, and storage. Nonetheless, emotion influences our cognitive processes, including memories, intuitions, and inklings, as a component of the retrieval system (Hawkin, 2017). This suggests that basic effects of emotion on cognitive learning exist. Put differently, feelings direct the process of learning through past experiences. These, which Immordino-Yang & Damasio (2015) have dubbed "emotional rudders," can assist students in recognizing and interpreting crucial information. Children's learning is significantly and decisively impacted by this rudder.

But occasionally, it might be conscious in cognitive processing (Immordino-Yang & Faeth 2010). For instance, when first using particular physics equations, students are unsure of which questions are matched and which are not. At this point, emotions are used to apply the new physical equations in an evaluative and rational manner. This indicates that since emotions influence people's decisions, emotional consequences are initially conscious. Learners have become aware of what situations are available and what are not through repetitive application trial and error. As a result, associated emotions become unconscious in subsequent stages. Emotions still have a purpose in learning, though. Stated differently, emotional intelligence plays a crucial role throughout the cognitive learning process. Therefore, difficulties with cognitive learning skills like evaluation, analysis, and reasoning may result from losing emotional rudder, which obstructs effective learning.

3.17 CHILDRENS EMOTION IN EDUCATIONAL CONTEXTS

Emotion has a complex part in children's education. Affective states have an impact on goal adoption, one of the motivational factors (Linnenbrink & Pintrich, 2002, quoted in Linnenbrink, 2007). Children who have enjoyed recent classes, for instance, typically choose to approach the learning objectives rather than avoiding them. When they succeed, though, the kids who have experienced grief might not feel as good. Stated differently, these kids could believe they lack the necessary skills and resources to accomplish the task, which could result in subpar academic achievement. One of the most important things that can support kids' learning and performance is goal-orientation. Emotions also have an impact on kids' participation in the classroom.

While negative affective states cause students to become less engaged in their studies, positive emotions encourage pupils to participate more in class.

Furthermore, children's brains are still developing and have underdeveloped systems, which makes their emotions more erratic. This implies that teachers must focus more on the emotional shifts in their students. When children first arrive at class on a daily basis, teachers typically observe that they are content, joyous, and even thrilled. However, by the middle of the lesson, pupils tend to become very negative and disengaged from the material. Children may become disinterested and lose focus throughout the class, which is one of the main causes. In addition, parents observe that their children typically experience a gradual increase in impatience and anxiety during school assignments. All of these imply that children's feelings fluctuate while they are learning. But occasionally, parents and educators ignore their kids' emotional shifts and even make them continue their education. This could spark a retaliation. For this reason, teachers should maintain a calm and welcoming learning environment in order to maximize the learning efficiency of the students. Depending on the children's feelings, they can adjust the learning environment if needed. Additionally, recognizing children's emotions can assist educators and caregivers in recognizing their preferred methods of learning. More specifically, researching dispositions helps educators determine if their methods of instruction are appropriate and successful.

In conclusion, affective neuroscience is the fundamental prerequisite and basis for emotion, influencing the expression, development, and regulation of human emotions. Because their brains are still developing, children have little capacity for emotion regulation and control. They therefore frequently exhibit emotional instability. Teachers should be aware of emotional shifts and variations in their students' learning as well, as emotions are connected to cognitive processing, motivation, and attention. Additionally, emotional thought is the area where emotion and cognition meet and has a big influence on how well kids learn. Emotion, in short, affects a wide range of domains and has a significant impact on children's education. Hence, it is imperative that educators and parents acknowledge the crucial role that emotion and emotional neuroscience play in the teaching of children.

3.18 SOCIAL AND AFFECTIVE NEUROSCIENCE OF EMBODIMENT

In order to comprehend the interaction between biological mechanisms, bodily and cognition, and social and emotional processes, embodiment has been examined in the context of social, affective, and cognitive psychology as well as in neuroscience research. Researchers have proposed new theoretical models that take into account biological systems governing homeostasis, brain processes, and the sensory-motor connection in addition to the environment (Tsakiris, 2017).

The body and the intellect were once understood to be distinct entities. It was believed that the body operated like a machine, sending sensory data to the mind and carrying out its orders. But like a computer, the mind would handle information in isolation (Pecher & Zwaan, 2005). This mind-body approach served as the foundation for many years for research in the fields of clinical psychology, neuroscience, and social and cognitive psychology (Marmeleira & Duarte Santos, 2019; Marshall, 2016).

However, a method that takes into account each person's integrality has taken the place of the binary discussion of mind and body. In turn, the relationship between the body, emotions, brain, and environment gives rise to embodiment (Marshall, 2016). As a result, neither the body nor the mind are perceived as a mere sensory-motor interface or as a collection of discrete cognitive processes and logical operations. When combined, the body and mind form a single, cohesive biological system that is influenced by experiences brought about by homeostatic self-regulation and linked to social interactions and environmental factors (Marmeleira & Duarte Santos, 2019). According to this viewpoint, embodiment is a depiction of the self and how it interacts with the outside environment. We address embodiment in social and affective processes in this chapter.

3.19 NEUROSCIENCE OF EMBODIMENT

Brain representations that are based on simulations of patterns and predictions created by our experiences at the perceptual and motor levels are how we experience embodiment (Barrett, 2017; Longo & Tsakiris, 2013). In addition to physical feelings like touch, pain, vibration, and body position, our perceptual experience is mediated by sensory inputs like auditory, visual, or vestibular sensations. Let's use the act of

holding a pen between the fingers as an example. The physical experience of holding the pen corresponds both spatially and temporally with the image of the fingers gripping it. The visual cortex processes incoming visual information regarding body location, such as fingers holding a pen, and associates it with a somatic representation of the sense of the visual space surrounding the body parts (Holmes & Spence, 2004; Kilteni et al., 2015). Efferent motor signals are used to carry out the motor action (in this case, gripping a pen), and afferent feedback is used to provide the corresponding touch sensation. The perception of one's own moving body parts is enhanced by the simultaneous integration of the proprioceptive and visuo-tactile signals (Longo & Tsakiris, 2013; Tsakiris, 2010). In addition to enabling one to distinguish between their own and other people's perceptions, these integration processes provide the foundation for experiences that are rooted in the body (thus, embodiment).

The way that the body and its surroundings are perceived is largely dependent on the brain regions known as the ventral premotor cortex (MPCv) and posterior parietal cortex (PPC) (Holmes & Spence, 2004). Encoding one's own position in space and contrasting it with what is observed are examples of visual-somatosensory coordination. In addition to visual stimulation (seeing the hand move and the fingers clutching the pen), multisensory neurons also react to tactile and proprioceptive stimulation (e.g., touch sensation while grasping a pen and awareness of the hand's location in space) (Graziano, 1999; Zopf et al., 2010). In simulations, the representation of an action can be used to track discrepancies between actual perception of the sensory environment and sensory expectations, as well as to forecast sensations (Barrett, 2017). Strong neuronal connections between the visual, motor, and somatosensory cortex can be explained by the constant coupling of proprioceptive and visuo-tactile information.

Particular neurons that activate during the observation and execution of actions can aid in these processes. According to early research on monkeys, certain neurons (in the pre-motor brain area F5) fire both while doing an action and when observing one being performed (Gallese, 2007; Rizzolatti et al., 1996), which may provide an explanation for simulation processes and the ability to comprehend the actions of others. We now refer to these neurons as mirror neurons. Certain neurons reacted when the monkey observed a grabbing motion, and these same neurons fired when the monkey actually made a grasping motion, according to research done by Rizzolatti et

al. (1996). A comparable response of this particular group of neurons was discovered in an additional experiment involving a second monkey and a human researcher (Rizzolatti et al., 1996). These findings show that when watching movement-related action, the mirror neuron system is activated. According to Rizzolatti et al. (1996), mirror neurons were discovered to be reciprocally connected in the posterior parietal cortex and somatotopically structured in the premotor cortex. These regions are thought to be analogous to the areas in monkeys that contain mirror neurons.

The results of the monkey experiments showed that, in addition to being activated during observation and action execution, the F5 area of the brain is also active during partially hidden observation. In this scenario, predictions about the outcome of the action can be made even in the absence of full visual information about the action's execution and interaction with the target object. Umiltà et al. (2001) studied monkeys under two experimental conditions: a "partial" vision condition in which the same action was shown, but the last portion was hidden, and a "total" vision condition in which the monkey was shown an action that was fully visible and directed at an object (hand-object interaction). According to the results, mirror neurons in the F5 area were activated in both experimental conditions (Umiltà et al., 2001). This lends credence to the idea that understanding an action can be predicated on predictions of the internal motor representation of the action, by anticipating the action's end goal as executed by others.

Gallese (2007) refers to the mirror neuron mechanism that enables us to comprehend others as "incorporated simulation." According to Gallese's (2007) included simulation theory, the mirror neuron system may be involved in social cognitive activities like language, interpreting the intents and behaviors of others, and ascribe mental states to others. The fusiform gyrus, superior temporal sulcus, posterior parietal cortex, ventral premotor cortex, and tonsil are believed to be parts of the mirror neuron system. Other research indicates that the system is involved in social cognition processes, such as facial expression recognition and ultimately empathy (Mier et al., 2010; Schulte-Rüther et al., 2007). All things considered, this evidence points to the existence of an embodied nature in both behaviors and cognitive processes. This embodiment enables the use of internal models to give sensations meaning and coherence, as well as the ability to run simulations to direct behavior. Barrett, 2017). As a result, brain simulations drive behavior, serve as filters for

sensory stimulus inputs, and create the experience of emotions and thought (see Barret review, 2017). On the other hand, altering multisensory inputs can change how the body is portrayed, leading to perceptions of different bodily parts and embodiments of the self and the self-other (see the section below). After briefly discussing the neuroscience of embodiment, this chapter explores how embodiment can be used to explain social and affective processes.

3.20 EMBODIMENT AND SOCIAL EMBODIMENT

Our subjective experiences rooted in our physical bodies are the core of embodiment (Gillihan & Farah, 2005). We recognize that we have a body, that we experience it to be our own, that it has a location in space, and that there is space surrounding it because of this bodily self-awareness. The integration of physiological cues from various sensory modalities—which indicate where body parts and the overall body are in space, as well as the fact that we are inside this body—is necessary for the establishment of this body self-awareness. In order to experiment and engage with the outside environment, this body adopts the perspective of the "self" (Blanke et al., 2015; Mul et al., 2019).

3.21 SOCIAL NEUROSCIENCE AND MORAL EMOTIONS

Numerous neuroimaging studies have attempted to isolate mirror neurons using non-invasive imaging techniques like fMRI and have sought for the human counterpart of the monkey "mirror neuron system" (MNS) (e.g. Dinstein, 2008; Iacoboni, 2005; Iacoboni et al., 2005; Schmidt et al., 2021). The findings showed that when participants actively carried out movements themselves, imitated movements produced by others, or passively observed others conducting movements, the anterior intraparietal area (AIP) and the ventral premotor areas (F5) were strongly activated. Furthermore, tasks requiring empathy were commonly shown to be being completed by AIP and F5 regions.

Together with the amygdala, posterior superior temporal sulcus, fusiform gyrus, inferior frontal gyrus, and inferior parietal cortex, these regions are involved in theory of mind and social cognition. These findings seem to point to the possibility of a common brain mechanism underlying social cognition.

Research on the human MNS has a lengthy history, however there are still significant methodological issues. In humans, electrophysiological single unit recordings are

impractical for a definitive demonstration of the properties of mirror neurons. Since fMRI is an indirect method based on blood oxygenation signal (BOLD) and does not directly measure neuronal activity, the majority of studies addressing MNS in humans rely on methods with low temporal resolution (see also the paragraph devoted to pitfalls at the end of the chapter). In this sense, ERPs can be very useful instruments for offering the temporal resolution required to investigate human health-related action and gesture recognition systems. From the standpoint of internal body representation, feelings of motor agency and body ownership are ways in which embodiment is conveyed. Because centrally generated motor orders come before voluntary movements, the experience of agency precedes motor actions and involves the efferent component (Tsakiris et al., 2006). The ability to feel control over one's body's movement when performing a task is dependent on the purpose and manner in which actions are carried out (Gallagher, 2000; Tsakiris et al., 2006). The sense of one's own body's presence is connected to body ownership.

Gallagher (2000) defines it as the constant presence in one's mental life—the sense that "my body" belongs to them. This sense of embodiment is experienced both passively—when one is touched, for example—and during the motor acts involved in carrying out a task (Tsakiris et al., 2006). The brain architecture of the body scheme is developed during life and is a dynamic update that is dependent on the body's sensory inputs and interactions with its surroundings (Cardinali et al., 2009). Because of this, we acquire cognitive and motor abilities as well as an awareness of our own bodies through these sensory encounters. In addition to affective experiences and internal body image, bodily experiences also influence embodiment (Braun et al., 2018; Marmeleira & Duarte Santos, 2019).

Thus, it is important to understand that the sense of body ownership results from both internal, interoceptive stimuli that form the internal body representation and external sensory stimuli that integrate various sensory signals (somatosensory, vestibular, visual, and somatosensory) to form body perception (Botvinick & Cohen, 1998; Kilteni et al., 2015; Tsakiris, 2010). The body scheme can locate and perceive a body part's position in space thanks to the interaction of multisensory information with motor systems during motor action (Margolis & Longo, 2014; Medina & Coslett, 2010). This helps the body scheme carry out actions related to the interaction with the environment (Assaiante et al., 2014).

Numerous studies have examined the plasticity of multisensory integration through simultaneous sensory stimuli of spatial and temporal congruence. These studies have demonstrated that after mere seconds of sensory manipulation, the incorporation of instruments, mirror images, and inanimate objects like a rubber hand, one can modulate one's bodily representations and peripersonal space. One's perception of peripersonal and body space can be altered by synchronous visuo-tactile or visuomotor interactions. This can lead to modifications of the body scheme and the sensation of body ownership, including that of another person's body part, as in the rubber hand illusion (Botvinick & Cohen, 1998; Holmes & Spence, 2004; Kilteni et al., 2015).

In this illusion, the participant's hand is obscured from view and is replaced by a prosthetic that resembles it and is placed in close proximity to the body, with its shoulder aligned with it. Hands must be touched precisely in the same place and at the same time in order for the illusion to occur in both the actual and the false. This interplay between the visuo-tactile and proprioceptive senses creates a tension between what is felt and seen in the prosthesis, which encourages the body scheme to incorporate the rubber hand and the sense of body ownership (Botvinick & Cohen, 1998). As a result, illusions that affect one's perception of body ownership may be used as experimental instruments to study peripersonal space and body representation (Costantini & Haggard, 2007).

In this context, it is plausible to propose that, as multiple studies have demonstrated, self-awareness is highly changeable and impacted by external sensory information. Nonetheless, we have internal representations created by interoceptors in addition to external sensory data, which enables us to be aware of our bodies (Tsakiris, 2017). Craig (2009) stated in a review that the subjective experiences of body and consciousness are rooted in the interoceptive representations found in the insular cortex. Being the brain's interoceptive region, the insula is essential to the representation of self-awareness because it integrates environmental cues with the sense of agency and control over one's own body. Additionally, the insula is connected to affective processing of the self and other as well as social cognition processes like empathy, self-representation, and identity (Craig, 2009; Tsakiris, 2017). According to Tsakiris (2017), interoception is therefore essential to both self-awareness and the

stability of the internal representation, which upholds the body's self-awareness as "mine" in spite of external cues and social interactions.

According to Niedenthal and Barsalou (2005), social neuroscience initiated the study of embodiment with the aim of gaining a deeper comprehension of social perception, attitudes, and emotions of both the self and others. Research has demonstrated that social experiences and the processes of perceived social information can impact embodiment, leaving us open to the possibility of feeling overlap in how other people's bodies are represented (Tsakiris, 2017). According to Sforza et al. (2010), synchronic touching causes the partner's facial features to be represented in the participant's own face when they perceive simultaneous touches on their partner's face due to the "enfacement" illusion; a synchronic touch does not cause this to occur. In addition to demonstrating the function of individual interoceptive sensitivity in the modulation of exteroceptor signals by stimulating multimodal synchronic recognition, Tajadura-Jiménez and Tsakiris (2014)'s investigation produced similar results. According to these findings, the sense of body ownership can be influenced by multisensory integration, and it is possible to make someone feel as though they own a portion of someone else's body. However, the perception of one's own body as distinct from others is influenced by one's own interoceptive sensitivity.

Research on the embodiment of the self and the other can show how perceptual illusions affect social perception of the other as well as multisensory integration. In the Paladino et al. (2010) study, pleasant affective responses were elicited more when one was touched synchronously in response to another person's contact than when the condition was asynchronous. Participants also reported feeling more in-tune with each other and seeing more facial similarity. To determine if racial bias can be influenced by the regulation of social perception in the embodiment of the other, more research has been done.

Peck et al. (2013) used virtual reality to examine whether the presence of light-skinned individuals in virtual bodies with dark, light, or purple skin, as well as those without a virtual body, affected implicit racial bias. The incorporation of the dark-skinned virtual body was found to reduce unconscious racial bias. Farmer et al. (2014) employed the rubber hand illusion on individuals who were Caucasian and used black-and-white hands. It was shown that the synchronous stimulation in the rubber

hand with dark skin had a more implicitly favorable attitude toward Black people and created a sense of body ownership.

It has been demonstrated that perceptual illusions are a useful tool for controlling how one's own body and another's body are embodied. It's interesting to note that understanding social processes like empathy, racial bias, the alteration of the negative connotation associated with the other's judgment, and social perception has been aided by the embodiment of the other. Despite current cultural disparities, research have demonstrated our malleability and quick adjustment to the implicit social attitude judgment when we experience the body of the other. It's possible that the development of research on social embodiment will help us comprehend how classification, bias, and discrimination stem from the embodiment of the other and its anatomical and physiological consequences.

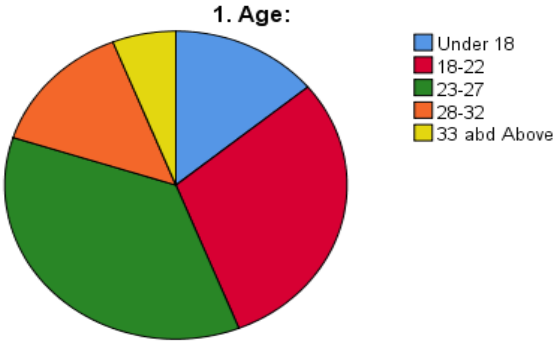
CHAPTER – 4

INTERPRETATION AND ANALYSIS

4.1 Age

1. Age:

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Under 18	7	14.0	14.0	14.0
	18-22	15	30.0	30.0	44.0
	23-27	18	36.0	36.0	80.0
	28-32	7	14.0	14.0	94.0
	33 and Above	3	6.0	6.0	100.0
	Total	50	100.0	100.0	



INTERPRETATION

From the above diagram it is clear that 7 respondents belong to the age group of above 18, 15 are from the age group of 18-22, 18 are from the age group of 23-27, 7 are from the age group of 28-32, 3 are from the age group of 33 and above.

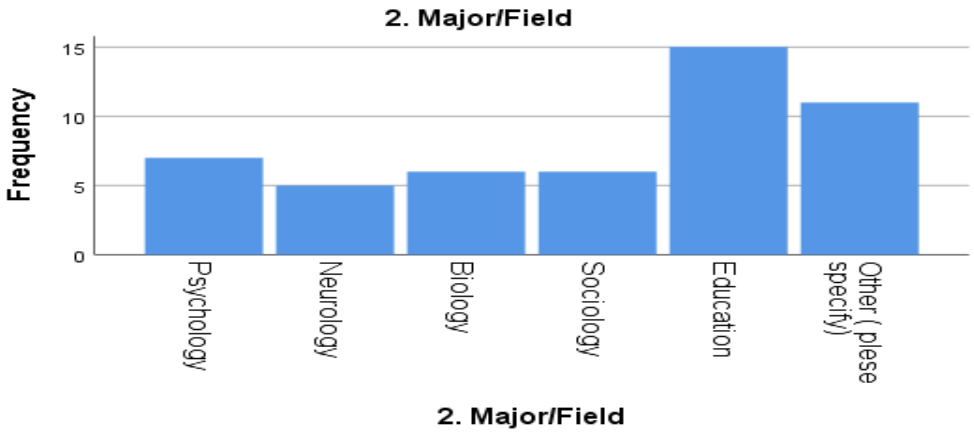
INFERENCE

• Most of the respondents are in the age of 23-27(36.0%).

4.2. Major/Field of study

3. Major/Field

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Psychology	7	14.0	14.0	14.0
	Neurology	5	10.0	10.0	24.0
	Biology	6	12.0	12.0	36.0
	Sociology	6	12.0	12.0	48.0
	Education	15	30.0	30.0	78.0
	Other (please specify)	11	22.0	22.0	100.0
	Total	50	100.0	100.0	



INTERPRETATION

From the above diagram it is clear that 7 respondents are psychology,5 respondents are neurology,6 respondents are biology,6 respondents are sociology,15 respondents are education and 11 respondents are from other field.

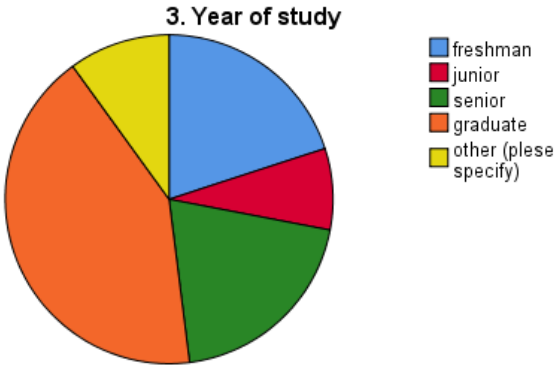
INFERENCE

• Majority of the respondents are from education field (30.0%).

4.3.Year of study

3. Year of study

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	freshman	10	20.0	20.0	20.0
	Junior	4	8.0	8.0	28.0
	Senior	10	20.0	20.0	48.0
	Graduate	21	42.0	42.0	90.0
	other (please specify)	5	10.0	10.0	100.0
	Total	50	100.0	100.0	



INTERPRETATION

From the above diagram 10 respondents are freshman, 4 respondents are juniors,10 respondents are seniors,21 respondents are graduate and 5 respondents are other type of studies.

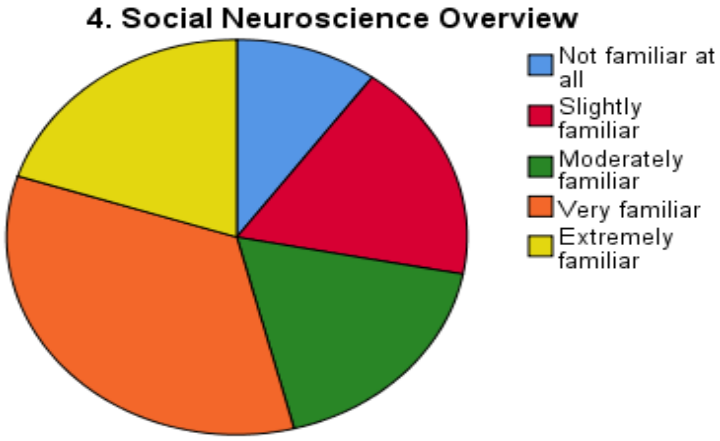
INFERENCE

• Majority of the respondents are graduates (42.0%).

4.4 How familiar are you with the field of social cognitive and affective neuroscience?

4. Social Neuroscience Overview

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not familiar at all	5	10.0	10.0	10.0
	Slightly familiar	9	18.0	18.0	28.0
	Moderately familiar	9	18.0	18.0	46.0
	Very familiar	17	34.0	34.0	80.0
	Extremely familiar	10	20.0	20.0	100.0
	Total	50	100.0	100.0	



INTERPRETATION

From the above diagram 5 respondents not familiar at all about social neuroscience ,9 respondents are slightly familiar influenced,9 respondents are had moderately familiar,17 respondents have very familiar, and 10 respondents have extremely familiar about social neuroscience.

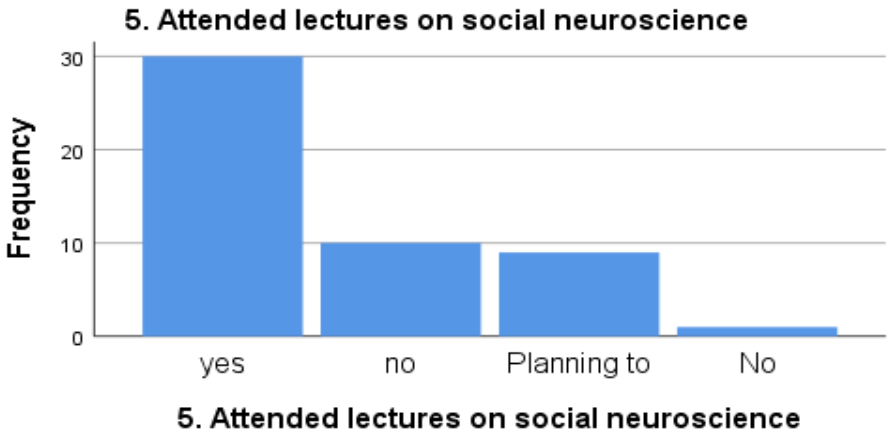
INFERENCE

• Most of the respondents are had very familiar about social neuroscience (34.0%).

4.5 Have you taken any courses or attended any lectures related to social cognitive or affective neuroscience?

5. Attended lectures on social neuroscience

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	30	60.0	60.0	60.0
	no	10	20.0	20.0	80.0
	Planning to	9	18.0	18.0	98.0
	No	1	2.0	2.0	100.0
	Total	50	100.0	100.0	



INTERPRETATION

From the above diagram 30 respondents are have attended lectures on social neuroscience,11 respondents are not attended and 9 respondents planning to.

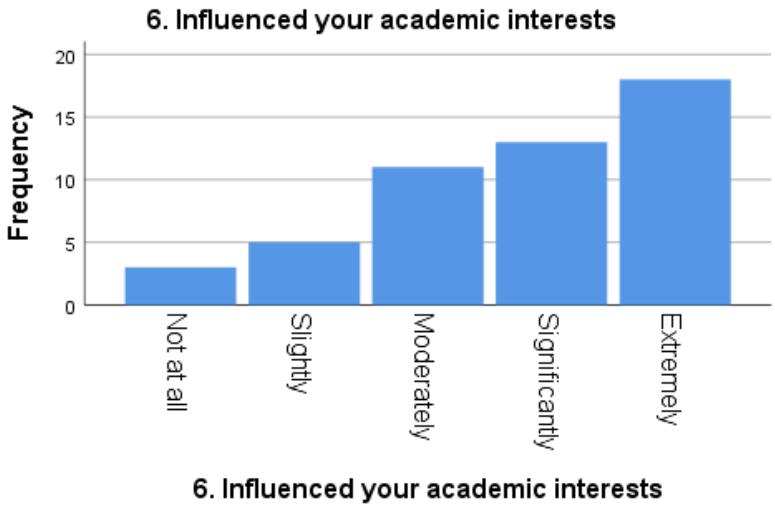
INFERENCE

• Majority of the respondents are attended lectures on social neuroscience (60.0%).

4.6. How has learning about social cognitive and affective neuroscience influenced your academic interests?

6. Influenced your academic interests

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	3	6.0	6.0	6.0
	Slightly	5	10.0	10.0	16.0
	Moderately	11	22.0	22.0	38.0
	Significantly	13	26.0	26.0	64.0
	Extremely	18	36.0	36.0	100.0
	Total	50	100.0	100.0	



INTERPRETATION

From the above diagram 3 respondents not at all influenced their academic interests,5 respondents are having slightly influenced,11 respondents are had moderately, and 13 have significantly, and 18 respondents have extremely influenced their academic interest.

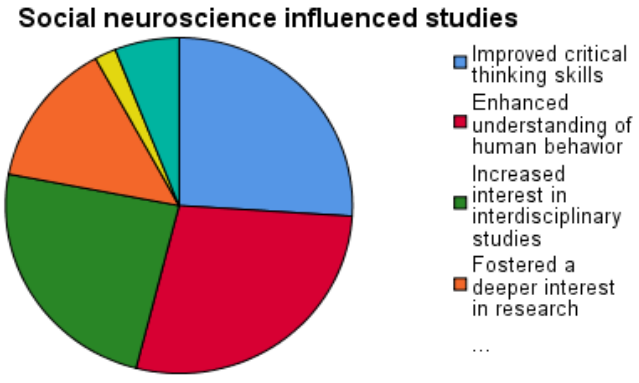
INFERENCE

• Majority of the respondents are had extremely influenced their academic interest (36.0%).

4.7. In what ways has your understanding of social cognitive and affective neuroscience affected your approach to your studies? (Select all that apply)

7.Social neuroscience influenced studies

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Improved critical thinking skills	13	26.0	26.0	26.0
	Enhanced understanding of human behaviour	14	28.0	28.0	54.0
	Increased interest in interdisciplinary studies	12	24.0	24.0	78.0
	Fostered a deeper interest in research	7	14.0	14.0	92.0
	No significant impact	1	2.0	2.0	94.0
	Other (Please specify):	3	6.0	6.0	100.0
	Total	50	100.0	100.0	



INTERPRETATION

From the above diagram 13 respondents have improved critical thinking skill,14 respondents are enhanced understanding of human behavior,12 respondents are

increased interest in interdisciplinary studies, and 7 respondents fostered a deeper interest in research,1 respondent have no significant impact and 3 respondents have other things influenced studies.

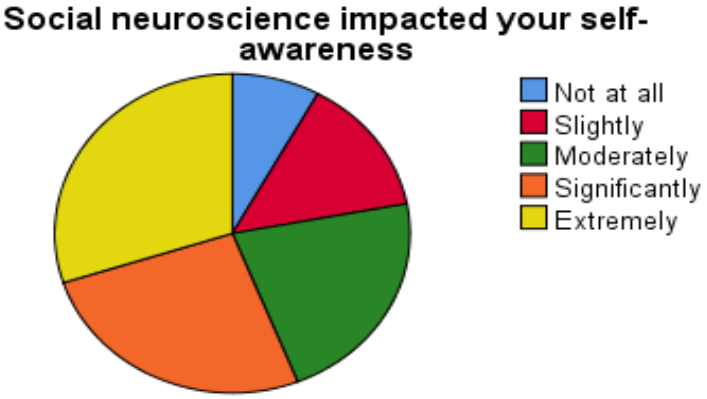
INFERENCE

• Majority of the respondents are enhanced understanding of human behavior (28.0%).

4.8. How has your knowledge of social cognitive and affective neuroscience impacted your personal growth and self-awareness?

Social neuroscience impacted your self-awareness

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all	4	8.0	8.0	8.0
	Slightly	7	14.0	14.0	22.0
	Moderately	11	22.0	22.0	44.0
	Significantly	13	26.0	26.0	70.0
	Extremely	15	30.0	30.0	100.0
	Total	50	100.0	100.0	



INTERPRETATION

From the above diagram 4 respondents not at all have impacted their self-awareness,7 respondents are having slightly impact,11 respondents are had moderately, and 13 have significantly, and 15 respondents have extremely impacted their self-awareness.

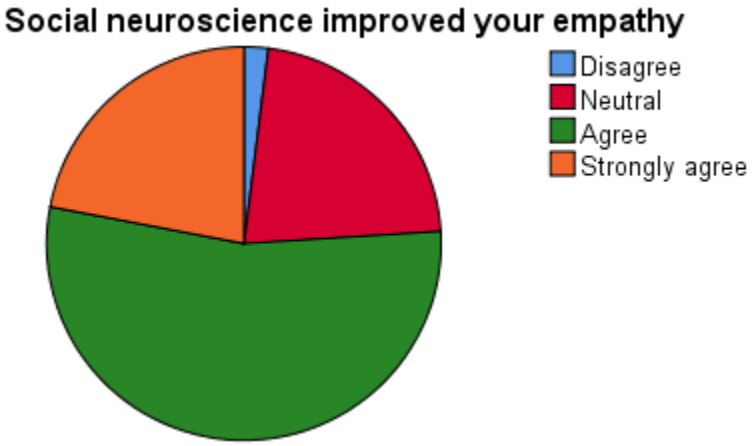
INFERENCE

• Majority of the respondents are had extremely impacted their self-awareness (30.0%).

4.9. Do you believe that understanding social cognitive and affective neuroscience has improved your ability to empathize with others?

9.Social neuroscience improved your empathy

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	1	2.0	2.0	2.0
	Neutral	11	22.0	22.0	24.0
	Agree	27	54.0	54.0	78.0
	Strongly agree	11	22.0	22.0	100.0
	Total	50	100.0	100.0	



INTERPRETATION

From the above diagram 11 respondents are strongly agree about the improvement of their empathy,27 respondents are agreed,11 respondents are neutral, and 1 is having disagree.

INFERENCE

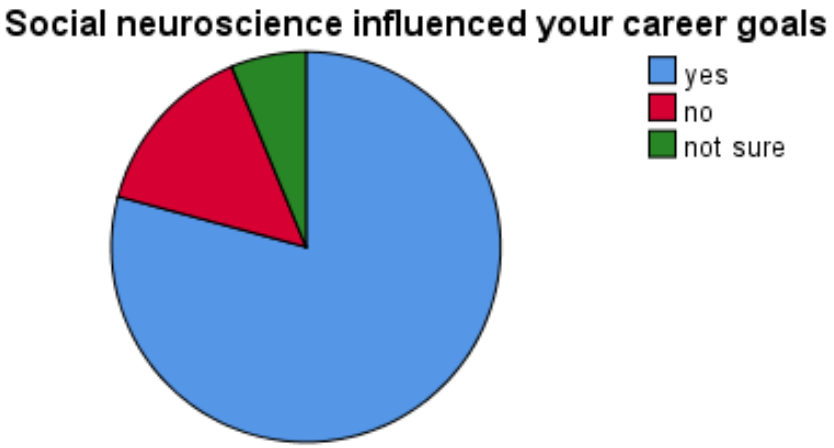
• Majority of the respondents are agreed about improved their empathy (54.0%).

4.10. Has studying social cognitive and affective neuroscience influenced your career

aspirations?

10.Social neuroscience influenced your career goals

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	38	76.0	79.2	79.2
	no	7	14.0	14.6	93.8
	not sure	3	6.0	6.3	100.0
	Total	48	96.0	100.0	
Missing	System	2	4.0		
Total		50	100.0		



INTERPRETATION

From the above diagram 38 respondents are agreed that neuroscience influenced their career goal, 7 respondents are not agreed and 3 respondents are not sure.

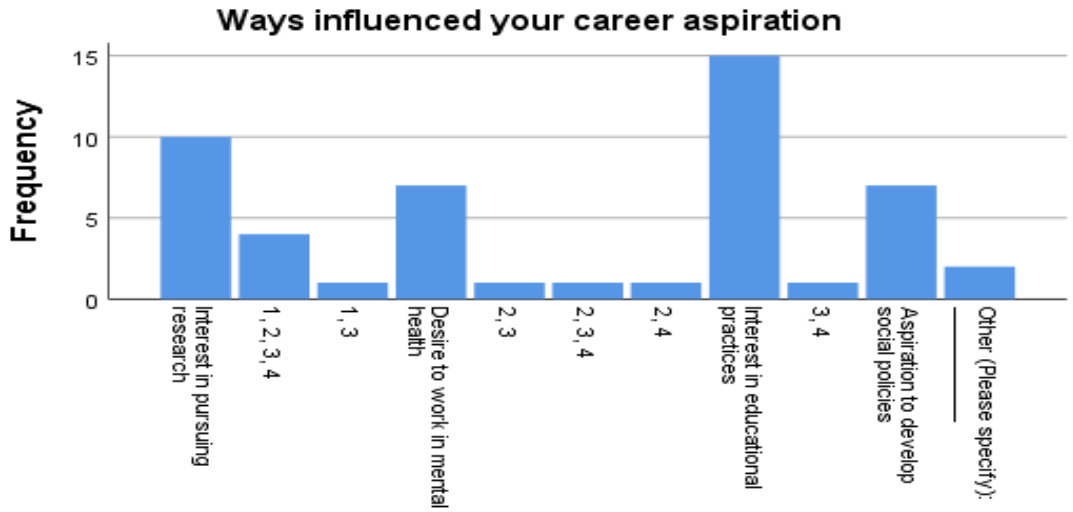
INFERENCE

• Majority of the respondents are yes (79.2%).

4.11. If yes, in what ways has it influenced your career aspirations? (Select all that apply)

11.Ways influenced your career aspiration

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Interest in pursuing research	10	20.0	20.0	20.0
	1, 2, 3, 4	4	8.0	8.0	28.0
	1, 3	1	2.0	2.0	30.0
	Desire to work in mental health	7	14.0	14.0	44.0
	2, 3	1	2.0	2.0	46.0
	2, 3, 4	1	2.0	2.0	48.0
	2, 4	1	2.0	2.0	50.0
	Interest in educational practices	15	30.0	30.0	80.0
	3, 4	1	2.0	2.0	82.0
	Aspiration to develop social policies	7	14.0	14.0	96.0
	Other (Please specify): _____	2	4.0	4.0	100.0
	Total	50	100.0	100.0	



INTERPRETATION

From the above diagram 10 respondents have interest in pursuing research,14 respondents are apply all ways of influenced their career aspirations,1 respondent is apply interest in pursuing research and interests in educational practices,7 respondents are desire to work in mental health,1 respondent have apply desire to work in mental health, interests in educational practices and aspiration to develop educational policies, 15 respondents have interest in educational practices,1 respondent apply interest in educational practices and aspiration to develop educational policies, 7 respondents have aspiration to develop educational policies and 2 respondents have other ways influenced their career.

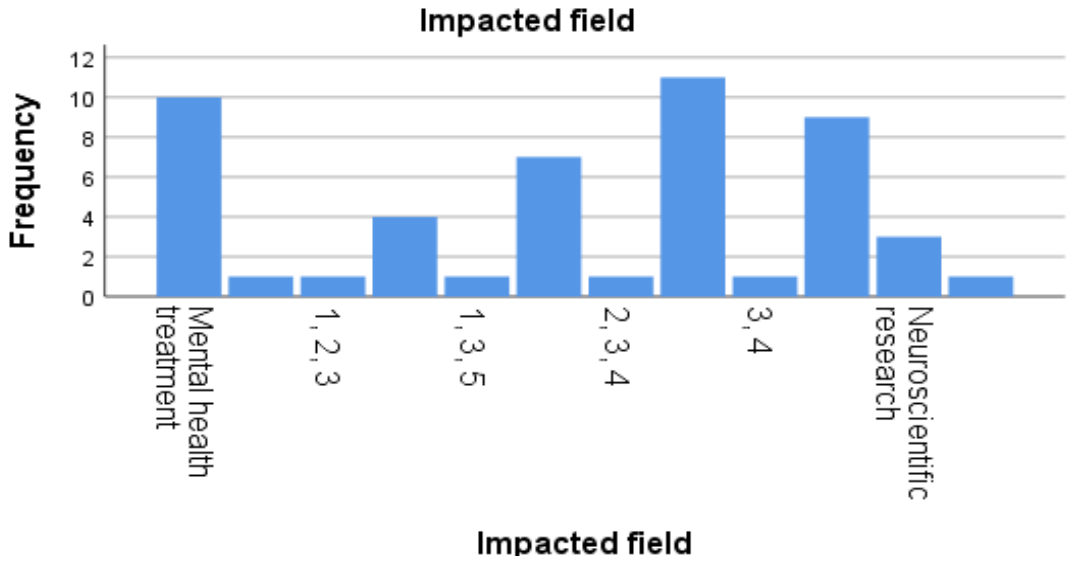
INFERENCE

• Most of the respondents are have interest in educational practices (30.0%)

4.12 Which areas do you think are most impacted by advancements in social cognitive and affective neuroscience? (Select all that apply)

Impacted field

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Mental health treatment	10	20.0	20.0	20.0
	1, 2	1	2.0	2.0	22.0
	1, 2, 3	1	2.0	2.0	24.0
	1, 2, 3, 4, 5	4	8.0	8.0	32.0
	1, 3, 5	1	2.0	2.0	34.0
	Educational practices	7	14.0	14.0	48.0
	2, 3, 4	1	2.0	2.0	50.0
	Social behavior understanding	11	22.0	22.0	72.0
	3, 4	1	2.0	2.0	74.0
	Cognitive development	9	18.0	18.0	92.0
	Neuroscientific research	3	6.0	6.0	98.0
	Other (Please specify): _____	1	2.0	2.0	100.0
	Total	50	100.0	100.0	



INTERPRETATION

From the above diagram 10 respondents have mental health treatment,1 respondent impacted mental health treatment and educational practices,1 respondent is impacted mental health treatment, educational practices and social behavior understanding ,4 respondents are impacted mental health treatment, educational practices, social behavior understanding, cognitive development and neuroscientific research,1 respondent have mental health treatment, social behavior understanding and neuroscientific research,7 respondents have educational practices,1 respondent impacted educational practices, social behavior understanding and cognitive development, 11 respondents have social behavior understanding, 1 respondents have impacted social behavior understanding and cognitive development,9 respondent have cognitive development,3 respondent have neuroscientific research and 1 respondent have other impacted field.

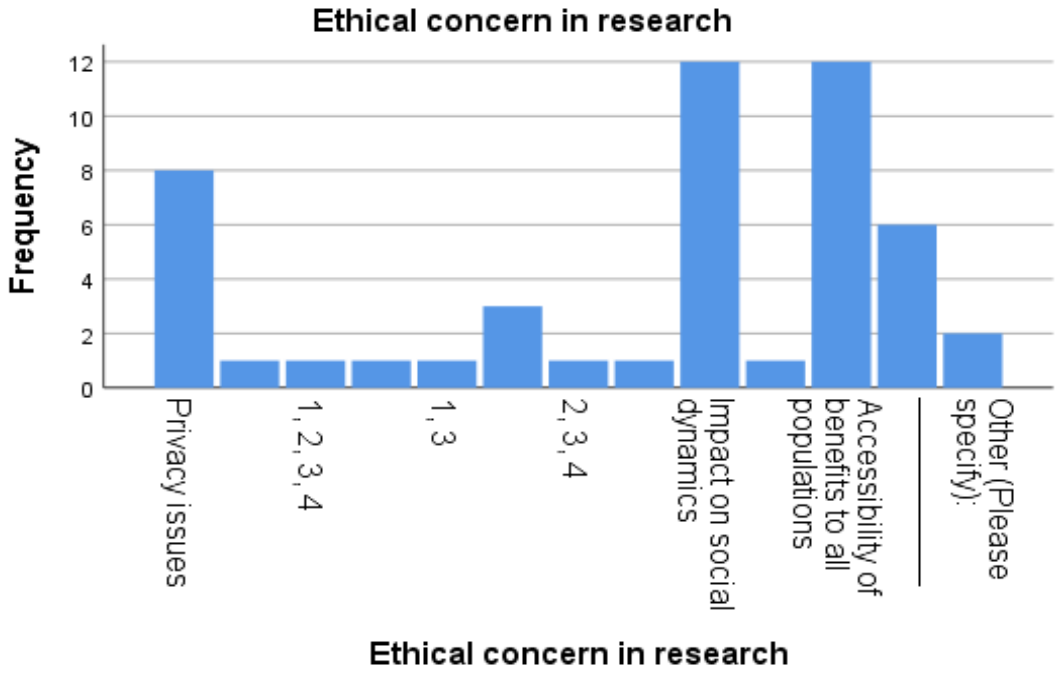
INFERENCE

• Most of the respondents are have social behavior understanding (22.0%).

4.13. What are your primary concerns regarding the ethical implications of research in social cognitive and affective neuroscience? (Select all that apply)

Ethical concern in research

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Privacy issues	8	16.0	16.0	16.0
	1, 2	1	2.0	2.0	18.0
	1, 2, 3, 4	1	2.0	2.0	20.0
	1, 2, 3, 4, 5	1	2.0	2.0	22.0
	1, 3	1	2.0	2.0	24.0
	Misuse of research findings	3	6.0	6.0	30.0
	2, 3, 4	1	2.0	2.0	32.0
	2, 4	1	2.0	2.0	34.0
	Impact on social dynamics	12	24.0	24.0	58.0
	3, 4, 5	1	2.0	2.0	60.0
	Accessibility of benefits to all populations	12	24.0	24.0	84.0
	None	6	12.0	12.0	96.0
	Other (Please specify): _____	2	4.0	4.0	100.0
	Total	50	100.0	100.0	



INTERPRETATION

From the above diagram 8 respondents have privacy issues,1 respondent have privacy issues and misuse of research findings,1 respondent have privacy issues, misuse of research findings, impact on social dynamics and accessibility of benefits to all populations,1 respondents have privacy issues, misuse of research findings, impact on social dynamics, accessibility of benefits to all populations and none,1 respondent have privacy issue and impact on social dynamics,3 respondents have misuse of research findings,1 respondent have misuse of research findings, impact on social dynamics and accessibility of benefits to all populations, 1 respondents have misuse of research findings and accessibility of benefits to all populations, 12 respondents have impacted social dynamics,12 respondent have accessibility of benefits to all populations,6 respondent have no ethical concern in research and 2 respondent have other ethical concerns in research.

INFERENCE

• Most of the respondents are have impact on social dynamics and accessibility of benefits to all populations (24.0%).

4.14 HYPOTHESIS TESTING

H0: There is no significant relationship between social settings and student wellbeing.

H1: There exists relationship between social settings and student wellbeing.

Correlations

		Social Neuroscience Overview	Social neuroscience influenced your career goals
Social Neuroscience Overview	Pearson Correlation	1	-.467**
	Sig. (2-tailed)		.001
	N	50	48
Social neuroscience influenced your career goals	Pearson Correlation	-.467**	1
	Sig. (2-tailed)	.001	
	N	48	48

**. Correlation is significant at the 0.01 level (2-tailed).

INTERPRETATION

Since p value = 0.00 which is less than 0.05 we reject null hypothesis. There exists strong relationship between social settings and student wellbeing.

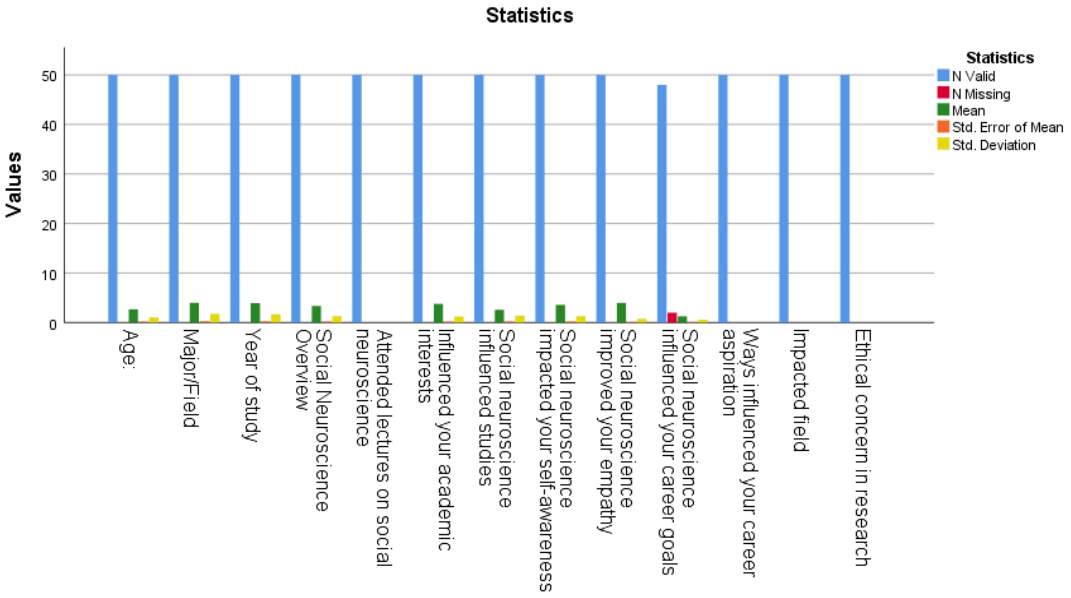
INFERENCE

There is a relationship between social settings and student wellbeing.

4.15 RANKING

Descriptive Statistics

	N	Mean	Std. Deviation
Social neuroscience influenced your career goals	48	1.27	.574
Social neuroscience influenced studies	50	2.56	1.387
Age:	50	2.68	1.077
Social Neuroscience Overview	50	3.36	1.274
Social neuroscience impacted your self-awareness	50	3.56	1.280
Influenced your academic interests	50	3.76	1.222
Year of study	50	3.94	1.659
Social neuroscience improved your empathy	50	3.96	.727
Major/Field	50	4.00	1.738
Valid N (listwise)	48		



INTERPRETATION

When taken as a whole, these factors shed light on the ways in which social neuroscience affects respondents' interests in school, as well as their aspirations for personal growth and careers. Standard deviations show the variety in answers, which emphasizes that although there are general tendencies, individual experiences and interpretations of social neuroscience can vary greatly. Comprehending these characteristics aids in placing the impact of social neuroscience within the respondent group in perspective, taking into account disciplinary backgrounds (academic majors) and demographic aspects (such age and academic stage).

INFERENCE

• Respondents' lives and studies have been impacted by social neuroscience in a variety of ways, from academic interests and job ambitions to personal growth.

• Social neuroscience is generally seen favorably and has a favorable impact, especially

when it comes to academic curiosity, empathy, and self-awareness.

• There is significant variation in the respondents' ages and academic levels (year of study),

indicating a varied sample group.

• Standard deviation variability shows that although general tendencies exist, individual responses and experiences with social neuroscience can vary greatly.

CHAPTER – 5

CONCLUSION

CHAPTER – 5

CONCLUSION

An innovative strategy for comprehending and improving student behavior, learning processes, and emotional regulation is the incorporation of social cognitive and affective neuroscience into educational methods. These multidisciplinary disciplines combine knowledge from cognitive science, psychology, and neuroscience to provide a thorough grasp of how people perceive, engage with, and affect one another. With a focus on the principles underpinning social behavior and cognition, social cognitive neuroscience provides profound insights into the mechanisms that influence our social interactions. Conversely, affective neuroscience explores how emotional experiences affect behavior and cognitive processes by probing the brain underpinnings of emotions. When combined, these domains promise to completely transform the way we approach teaching and learning while providing priceless contributions to education in a variety of ways.

First of all, by clarifying the effects of social interactions and emotional states on memory and knowledge retention, the combination of various disciplines improves learning and memory. Positive social connections can greatly increase motivation and engagement, which in turn can improve academic performance, according to research in social cognitive neuroscience. One way to improve students' learning experience is through cooperative learning activities, when students solve issues together and develop a sense of belonging and support from one another. In a similar vein, research on affective neuroscience has shown that emotions are essential for memory consolidation. Excitation or curiosity are examples of emotions that can help with information encoding, which helps students retain what they have learnt. Teachers can use this information to customize their instruction and create classrooms that encourage healthy social interactions and encouraging emotional climates. By utilizing the power of social and emotional dynamics, strategies like group projects, peer tutoring, and the inclusion of emotionally compelling information can assist maximize academic success.

Second, strategies for students' emotional control and mental health assistance are informed by knowledge from affective neuroscience. Schools are realizing more and

more how critical it is to support kids' mental health needs in order to foster their general wellbeing and academic achievement. Affective neuroscience offers research-proven techniques that can be included into instructional frameworks to support students in efficiently managing stress, anxiety, and depression. Through modifications to the brain circuits linked to attention and emotional processing, mindfulness practices, for instance, have been demonstrated to lower stress and enhance emotional control. Another useful technique that might assist students in reframing negative beliefs and creating healthier coping skills is cognitive-behavioural therapies. Teachers may establish a nurturing environment that fosters mental health and resilience by implementing these strategies into the curriculum, which will ultimately increase students' ability to learn and succeed.

Furthermore, knowledge of the neurological underpinnings of social behaviours like as empathy, cooperation, and conflict resolution facilitate the development of focused therapies meant to foster important social skills. Certain brain regions, such as the medial prefrontal cortex and the mirror neuron system, have been linked to empathy and perspective-taking in social cognitive neuroscience studies. These observations can guide the creation of educational initiatives aimed at improving students' social skills. Role-playing exercises and socio-emotional learning (SEL) curricula, for instance, can assist students in developing empathy and collaboration skills, strengthening their bonds with others and equipping them for success in a variety of social settings. Teachers can help build emotionally intelligent people who can navigate complicated social dynamics in both personal and professional situations by cultivating these skills.

By identifying and meeting the many emotional and cognitive requirements of pupils, the fusion of social cognitive and affective neuroscience also advances inclusive education. Conventional teaching methods frequently fall short of meeting the diverse backgrounds, skills, and learning preferences of students in the classroom. However, educators may design adaptive learning environments that meet the individual needs of every student by comprehending the brain foundations of emotion and learning. For example, individualized therapies that target particular brain circuits linked to learning impairments or emotional disorders can be beneficial for students. This inclusive approach promotes a sense of acceptance and belonging, which is essential

for both social and academic success, in addition to supporting each learner's overall growth.

Furthermore, real-time monitoring of student engagement and learning processes is made possible by developments in neurofeedback and neuroimaging technology. Neuroimaging methods like electroencephalography (EEG) and functional magnetic resonance imaging (fMRI) offer comprehensive insights into brain activity during various learning tasks. Personalized learning strategies that take into account each learner's strengths and shortcomings can be created using this information. For instance, instructors can use techniques to increase attention and concentration if neuroimaging shows that a student struggles to focus during particular kinds of work. Providing pupils with immediate feedback on their brain activity, or neurofeedback, can help them learn how to control their own emotional and cognitive states. By enabling prompt modifications to instructional tactics and interventions, these technologies improve student learning outcomes and foster individualized learning opportunities.

Social cognitive and emotional neuroscience discoveries have wider ramifications for educational policy and societal influence than just their immediate pedagogical benefits. Using this information, policymakers may push for holistic development, social-emotional learning, and mental health as top priorities in school systems. Policies that require SEL programs to be included in the curriculum, for instance, can guarantee that children acquire critical social and emotional competencies in addition to academic information. Furthermore, teacher preparation programs can be improved by incorporating instruction on the fundamentals of social cognitive and affective neuroscience. This will provide teachers with the skills and information they need to establish safe and nurturing learning environments. Policymakers may help develop educational systems that encourage both academic brilliance and emotional well-being by promoting a culture of mental health awareness and emotional support.

In summary, the incorporation of social cognitive and affective neuroscience into educational practices has the potential to significantly enhance learning outcomes and promote the growth of socially and emotionally competent persons. Educators, legislators, and mental health specialists can work together to develop learning environments that enable children to flourish intellectually, socially, and emotionally

by adopting these multidisciplinary principles. This all-encompassing method of teaching equips students to make meaningful contributions to a world society that is becoming more linked and complex. The ability to address students' diverse needs and provide them with the knowledge, skills, and emotional resilience they need to meet the challenges of the twenty-first century is what makes the integration of social cognitive and affective neuroscience into education so potentially revolutionary.

REERENCE

REFERENCE

- http://hdl.handle.net/10603/286125
- http://hdl.handle.net/10603/104949
- http://hdl.handle.net/10603/433240
- https://www.researchgate.net/publication/273397956_Social_Cognitive_and_Affective_Neuroscience_in_Human-Machine_Systems_A_Roadmap_for_Improving_Training_Human-Robot_Interaction_and_Team_Performance
- https://academic.oup.com/scan
- https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2555421/
- Lieberman, M. D. (2007). Social cognitive neuroscience: A review of core processes. Annual Review of Psychology*, 58, 259-289. =
- Blakemore, S.-J. (2008). The social brain in adolescence. *Nature Reviews Neuroscience*, 9(4), 267-277.
- Gross, J. J. (2015). Emotion regulation: Current status and future prospects. Psychological Inquiry*, 26(1), 1-26.
- Masten, C. L., Telzer, E. H., Fuligni, A. J., Lieberman, M. D., & Eisenberger, N. I. (2012) Time spent with friends in adolescence relates to less neural sensitivity to later peer rejection. Social Cognitive and Affective Neuroscience, 7(1), 106-114.
- Roeser, R. W., Eccles, J. S., & Sameroff, A. J. (2000). School as a context of early adolescents' academic and social-emotional development: A summary of research findings. The Elementary School Journal, 100(5), 443-471.
- Zins, J. E., Weissberg, R. P., Wang, M. C., & Walberg, H. J. (2004).Building academic success on social and emotional learning.
- Crone, E. A., & Dahl, R. E. (2012). Understanding adolescence as a period of social-affective engagement and goal flexibility. Nature Reviews Neuroscience, 13(9), 636-650.
- Powers, K. E., Wagner, D. D., Norris, C. J., & Heatherton, T. F. (2013). Socially excluded individuals fail to recruit medial prefrontal cortex for negative social scenes. Social Cognitive and Affective Neuroscience, 8(2), 151-157.

- Kross, E., Berman, M. G., Mischel, W., Smith, E. E., & Wager, T. D. (2011). Social rejection shares somatosensory representations with physical pain. Proceedings of the National Academy of Sciences, 108(15), 6270-6275.
- Davidson, R. J., & McEwen, B. S. (2012). Social influences on neuroplasticity: Stress and interventions to promote well-being. Nature Neuroscience, 15(5), 689-695.
- Adolphs, R. (2009). The social brain: Neural basis of social knowledge. Annual Review of Psychology, 60(1), 693-716.
- Blakemore, S.-J. (2012). Development of the social brain in adolescence. Journal of the Royal Society of Medicine, 105 (3), 111-116.
- Carter, R. M., & Huettel, S. A. (2013). A nexus model of the temporal–parietal junction. Trends in Cognitive Sciences, 17 (7), 328-336.
- Crone, E. A., & Dahl, R. E. (2012). Understanding adolescence as a period of social–affective engagement and goal flexibility. Nature Reviews Neuroscience, 13(9), 636-650.
- Decety, J., & Jackson, P. L. (2004). The functional architecture of human empathy. Behavioural and Cognitive Neuroscience Reviews, 3 (2), 71-100.
- Eisenberg, N., & Morris, A. S. (2001). The origins and social significance of empathy-related responding. A Review of Empathy and Sympathy in Children and Adolescents, 3-25.
- Lieberman, M. D. (2007). Social cognitive neuroscience: A review of core processes. Annual Review of Psychology, 58 (1), 259-289.
- Mitchell, J. P. (2009). Inferences about mental states. Philosophical Transactions of the Royal Society B: Biological Sciences, 364 (1521), 1309-1316.
- Olsson, A., & Phelps, E. A. (2007). Social learning of fear. Nature Neuroscience, 10 (9), 1095-1102.
- Rilling, J. K., & Sanfey, A. G. (2011). The neuroscience of social decision-making. Annual Review of Psychology, 62 (1), 23-48.
- Saxe, R. (2006). Uniquely human social cognition. Current Opinion in Neurobiology, 16 (2), 235-239.
- Saxe, R., & Powell, L. J. (2006). It's the thought that counts: Specific brain regions for one component of theory of mind. Psychological Science, 17 (8), 692-699.

- Schilbach, L., Eickhoff, S. B., Mojzisch, A., & Vogeley, K. (2008). What's in a smile? Neural correlates of facial embodiment during social interaction. Social Neuroscience, 3 (1), 37-50.
- Siegel, D. J. (2001). Toward an interpersonal neurobiology of the developing mind: Attachment relationships, "mindsight," and neural integration. Infant Mental Health Journal, 22(1-2), 67-94.
- Somerville, L. H., & Casey, B. J. (2010). Developmental neurobiology of cognitive control and motivational systems. Current Opinion in Neurobiology, 20(2), 236-241.
- Van Overwalle, F. (2009). Social cognition and the brain: A meta-analysis. Human Brain Mapping, 30(3), 829-858.
- Völlm, B. A., Taylor, A. N., Richardson, P., Corcoran, R., Stirling, J., McKie, S., Elliott, R., Deakin, J. F. W., & Anderson, I. M. (2006). Neuronal correlates of theory of mind and empathy: A functional magnetic resonance imaging study in a nonverbal task. Neuroimage, 29*(1), 90-98.
- Zelazo, P. D., & Cunningham, W. A. (2007). Executive function: Mechanisms underlying emotion regulation. Handbook of Emotion Regulation, 135-158.
- Zaki, J., & Ochsner, K. (2012). The neuroscience of empathy: Progress, pitfalls and promise. Nature Neuroscience, 15(5), 675-680.
- Tamnes, C. K., Walhovd, K. B., Torstveit, M., Sells, V. T., & Fjell, A. M. (2013). Performance monitoring in children and adolescents: A review of developmental changes in the error-related negativity and brain maturation. Developmental Cognitive Neuroscience, 6, 1-13
- Decety, J., & Sommerville, J. A. (2003). Shared representations between self and other: A social cognitive neuroscience view. Trends in Cognitive Sciences, (12), 527-533.
- Frith, C. D., & Frith, U. (2006). The neural basis of mentalizing. Neuron, 50(4), 531-534.
- Gallagher, H. L., & Frith, C. D. (2003). Functional imaging of 'theory of mind'. Trends in Cognitive Sciences, 7(2), 77-83.
- Grossmann, T., & Johnson, M. H. (2007). The development of the social brain in human infancy. European Journal of Neuroscience, 25(4), 909-919.

- Masten, C. L., Eisenberger, N. I., Pfeifer, J. H., Dapretto, M., & Fuligni, A. J. (2010). Witnessing peer rejection during early adolescence: Neural correlates of empathy for experiences of social exclusion. Social Neuroscience, 5(5-6), 496-507.
- Nelson, E. E., Leibenluft, E., McClure, E. B., & Pine, D. S. (2005). The social re-orientation of adolescence: A neuroscience perspective on the process and its relation to psychopathology. Psychological Medicine, 35(2), 163-174.
- Overgaauw, S., Güroğlu, B., Rieffe, C., & Crone, E. A. (2012). Behaviour and neural correlates of empathy in adolescents. Developmental Neuroscience, 34(3-4), 243-252.
- Pfeifer, J. H., & Peake, S. J. (2012). Self-development: Integrating cognitive, socioemotional, and neuroimaging perspectives. Developmental Cognitive Neuroscience, 2(1), 55-69.
- Sebastian, C. L., Viding, E., Williams, K. D., & Blakemore, S.-J. (2010). Social brain development and the affective consequences of ostracism in adolescence. Brain and Cognition, 72(1), 134-145.
- Steinberg, L. (2008). A social neuroscience perspective on adolescent risk-taking. Developmental Review, 28(1), 78-106.

APPENDIX

APPENDIX

Impact of Social Cognitive and Affective Neuroscience on Students

Demographic Information:

1. **Age:**

☐Under 18

☐18-22

☐23-27

☐28-32

☐33 and above

2. **Major/Field of Study:**

☐Psychology

☐Neuroscience

☐Biology

☐Sociology

☐Education

☐Other (Please specify): _____

3. **Year of Study:**

☐Freshman

☐Sophomore

☐Junior

☐Senior

☐Graduate

☐Other (Please specify): _____

Knowledge and Exposure:

4. **How familiar are you with the field of social cognitive and affective neuroscience?**

   ☐Not familiar at all

   ☐Slightly familiar

   ☐Moderately familiar

   ☐Very familiar

   ☐Extremely familiar

5. **Have you taken any courses or attended any lectures related to social cognitive or affective neuroscience?**

   ☐Yes

   ☐No

   ☐Planning to

Impact on Academic and Personal Development:

6. **How has learning about social cognitive and affective neuroscience influenced your academic interests?**

☐Not at all

☐Slightly

☐Moderately

☐Significantly

☐Extremely

7. **In what ways has your understanding of social cognitive and affective neuroscience affected your approach to your studies?** (Select all that apply)

   ☐Improved critical thinking skills

   ☐Enhanced understanding of human behavior

   ☐Increased interest in interdisciplinary studies

   ☐ Fostered a deeper interest in research

   ☐No significant impact

   ☐Other (Please specify): _____

8. **How has your knowledge of social cognitive and affective neuroscience impacted your personal growth and self-awareness?**

   ☐Not at all

   ☐Slightly

   ☐Moderately

   ☐Significantly

☐Extremely

9. **Do you believe that understanding social cognitive and affective neuroscience has improved your ability to empathize with others?**

   ☐Strongly disagree

   ☐Disagree

   ☐Neutral

   ☐Agree

   ☐Strongly agree

   Practical Applications and Career Aspirations:

10. **Has studying social cognitive and affective neuroscience influenced your career aspirations?**

    ☐Yes

    ☐No

    ☐Not sure

11. **If yes, in what ways has it influenced your career aspirations?** (Select all that apply)

    ☐Interest in pursuing research

    ☐Desire to work in mental health

    ☐Interest in educational practices

    ☐Aspiration to develop social policies

☐Other (Please specify): _____

12. **Which areas do you think are most impacted by advancements in social cognitive and affective neuroscience?** (Select all that apply)

☐Mental health treatment

☐Educational practices

☐Social behavior understanding

☐Cognitive development

☐Neuroscientific research

☐Other (Please specify): _____

Ethical Considerations and Concerns:

13. **What are your primary concerns regarding the ethical implications of research in social cognitive and affective neuroscience?** (Select all that apply)

☐Privacy issues

☐Misuse of research findings

☐Impact on social dynamics

☐Accessibility of benefits to all populations

☐None

☐Other (Please specify): _____

Open-ended Question:

14. **In your opinion, what are the most exciting potential developments in the field of social cognitive and affective neuroscience, and how might they impact society?**