

INTERACTION EFFECT OF INSTRUCTIONAL STRATEGIES (COLLABORATIVE TECHNO - ENHANCED ANCHORED INSTRUCTION AND TRADITIONAL METHOD) AND LEARNING STYLES ON SOCIAL SKILLS AMONG SECONDARY SCHOOL PUPILS

By

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ABSTRACT

The fact that the future of a nation lies in the hands of its knowledgeable, technologically skilled, and civilized citizens is irrefutable. Secondary schools are primary centers for acquiring academic excellence as well as essential life skills. With each student being unique in his ability, learning styles, and social background, diverse experiences in secondary school help students acquire lifelong utilizable Social Skills as a part of their schooling. Physics Education when suitably integrated with Information and Communication Technology (ICT) and constructive learning strategies is said to promote academic success, develop interpersonal and intrapersonal skills, and foster overall well being of young adolescents. With this standpoint, the present study aims to investigate the main and interaction effects of instructional strategy named Collaborative Techno-Enhanced Anchored Instruction (CTEAI) and learning styles on social skills among Secondary School Pupils. Being an experimental study, the findings highlight that CTEAI is significantly more effective than traditional methods of instruction in developing social skills among secondary school students. This paper also provides educational implications which helps educationalists undertake initiatives for appropriate infusion of innovative teaching-learning strategies that further enhance the social skills of secondary school students.

Keywords : Anchored Instruction, Techno-enhanced Instruction, Learning Styles, Social Skills, Secondary School Pupils.

INTRODUCTION

School being the center for learning of basic reading, writing, and math, promotes acquisition of most academic skills as students go through their regular secondary schooling. Science education is an indispensable part of academic instruction all around the world. Physics, being a complex, abstract, and mathematical branch of Science, Physics learning in secondary school facilitates the development of lifelong utilizable academic and life skill competencies in students. Most prominently, Physics education teaches students to discover truth, generate new knowledge, develop flexible thinking, promote

teamwork, and use problem solving in most situations of life. Present secondary school students, being born as 'Digital Natives' show close intimacy with technology and digital devices. Hence, it is inevitable for today's educators to adjust their instructional strategies to current trends, adopt new teaching-learning methods, and move from traditional teaching to more innovative and techno-enhanced teaching and learning of Physics.

Students in secondary school are diverse in terms of their ability levels, family and cultural background, and social status. In addition to academics, secondary school also forms a center for acquisition of many essential social skills.

During secondary schooling, students mingle with people both of their age, younger, and older on a daily basis. With these encounters, they acquire various social skills unknowingly over the years. At adolescence, school and social life is a positive experience for most, but for some it may be frightening and demanding. Some students, because of their strong family background are bestowed with social skills; but not all. If ignored by parents and teachers, these students may develop the inability to face daily life trials and may struggle or become unsuccessful both in academics as well as healthy social living. Today the biggest challenge of educators is reaching out to each child's academic and personality development needs. Hence, along with the priority given to academics, schools, and educators, the need for developing social skills by incorporating these skills in the teaching and learning process must be recognized. In the light of these claims, the paper explores the effectiveness of Collaborative Techno-Enhanced Anchored Instruction against traditional methods of teaching and learning styles on development of social skills among secondary school pupils.

1. Need, Rationale, and Significance of the Study

Adolescent's life is highly challenging and demanding both academically and socially. Although all children are born with certain innate social competencies, as they grow, teenagers face tremendous pressures from family, peers, school, and society at large. While they are expected to show independence in study habits and organized way of carrying out daily activities, parents do not permit them to act older in terms of dressing, friendship, or use of technology. When they require guidance, help or support, parents may not have suitable knowledge, time, or parenting skills to correct their wards and instill important life skills in them. Coping with number of activities in school, studying more than six subjects with vast syllabus and facing examinations frequently adds to academic stress. Generation gaps between teens, teachers and parents, identity crisis, constant comparison with others, and peer demands cause emotional, social, and psychological stress in students. This stress may further lead to behavioral problems like disrespecting others, use of awful language, irresponsible behavior, intolerance to situations, anger and

aggressiveness, and physical fights. Affinity of present generation towards digital devices also separates them from real-world interactions and social life. These challenges affect both academic achievement and social life of secondary school students.

Physics is one of the compulsory branches of Science in most curricula. Physics curriculum of secondary schools of Karnataka State Board and its teaching-learning process, when analyzed shows that Physics syllabus is vast and intense consisting of both simple and abstract topics. Each class is non-streamed with students of mixed abilities and diverse learning styles undergoing mass instruction. Although teachers are well qualified, there is no measure of their teaching competence in providing engaging and challenging experiences that develops both academic and social skills of diverse students. Teaching-learning process in Physics classrooms is fixed and time-bound. Due to time constraints, added responsibilities in administrative works, tremendous pressure of completing unwieldy curriculum in relatively short stipulated time, over-emphasis on test-performance results, large student number, and class management issues, most teachers find difficulty in implementing new and innovative instructional strategies that lay emphasis on developing social skills of students along with Science achievement.

Aikenhead (2006) asserts that canonical science is very hard to use in everyday life. In classrooms, Physics is taught in isolation of daily life situations. Most students consider Physics tough, abstract, and difficult as they cannot relate their learning to day-to-day living. According to Sadler (2011), socio-scientific issues are open-ended, multifaceted social issues with conceptual links to Science. Hence, researchers assert that right from an early age, science instruction should integrate the discussion of socio-scientific issues, because such discussion is challenging in nature, bridge the gap between school science and students' lived experience, develop sensitivity towards everyday problems, and help extrapolate the conceptual understanding of Physics to daily life problem-solving with scientific and humanistic approach. Real-world interactions build social skills like empathy, inter-personal skills, communication, decision making and critical thinking,

coping, and self management skills (Chiniwar, 2012; Ajithkumar, 2009). Thus, problem-oriented acquisition of knowledge should be the prime focus of instruction and must allow students to appreciate the value of information learnt in the classroom. This helps them overcome stress and challenges of everyday life.

Students with social deficits experience frequent failures with both peers and adults and often require explicit social skills instruction (Miller et al., 2010). Teachers in classrooms rarely emphasize the fact that learning Physics makes one know how to solve problems independently, think clearly, reason out logically, manage time efficiently, and learn to adapt themselves to versatile problematic situations of life suitably. Social skills mastered in early years of life help in decision making, conflict handling, demonstrating leadership skills, self management, and self motivation in future both in personal and professional life. These skills in turn help students adapt to any changing social environment in a more flexible manner. Dinescu et al.'s (2011) study have identified an alarming decline in young people's interest for studying Physics due to old-fashioned approach of teaching-learning process. Traditional teaching is found to be deficient in providing students with the opportunity to develop basic social skills. No scope exists for any student who individually listens to mass instruction in classrooms to develop any interpersonal or intrapersonal social skills. Thus, Callahan et al. (2009); Bransford et al. (1990) and Pawattana et al. (2014) have identified the immediate need for change in instructional strategy of Physics from traditional methods to effective strategies of constructivist learning like cooperative learning and the use of technology tools in classroom instruction.

Comprehensive analysis of past research and evaluation of present scenario of Physics Education strongly supports the belief of investigator that it is the responsibility and the need of the hour for academicians, schools, and teachers to shift from traditional chalk-and-board or lecture methods of teaching to innovative teaching-learning approaches that can inculcate both academic and life-skills in secondary school students. With this strong belief and drive, the investigator wanted to test the effectiveness of the

instructional strategy named Collaborative Techno-Enhanced Anchored Instruction, which finds its roots in strong constructivist theoretical framework and emphasizes the shift from teacher-centered to learner-centered approach of Physics instruction to foster development of social skills in secondary school students.

2. Variables Involved in this Study

2.1 Independent Variables

Two independent variables were involved in the present study, namely Instructional Strategies and Learning Styles.

2.1.1 Instructional Strategies

2.1.1.1 Collaborative Techno-Enhanced Anchored Instruction (CTEAI)

Collaborative Techno-Enhanced Anchored Instruction (CTEAI) is a new technology-based constructivist approach adapted to Physics instruction with a belief that people learn best when the content is meaningful to them. The thought behind the formulation of CTEAI was obtained from a novel model for technology-based learning called Anchored Instruction. Principally, Anchored Instruction was developed by The Cognitive and Technology Group at Vanderbilt (CTGV) in 1990 under the leadership of John Bransford. The prime focus of Anchored Instruction was to base the instruction in anchored (situated), holistic, realistic, video-based, complex problem solving environments that both teachers and students can explore. Anchored Instruction helps students to develop confidence, skills, and knowledge necessary to solve problems and become independent thinkers and learners.

In CTEAI, the learning material is presented in an authentic and meaningful problem-based context that serves as an 'Anchor'. In the present study, "anchoring" refers to the blending of Physics content of Karnataka Board Physics Syllabus with a realistic and authentic problematic context that is explored by students using multimedia based Anchored Instruction. Complex and ill-structured problems in the form of a problem-based story related to Physics is presented to students. The students "play" an authentic role of problem solver working in collaborative groups using digital devices while investigating the problem, identifying gaps to their knowledge, researching the information

needed to solve the problem, and developing solutions. The teacher plays the role of a guide or facilitator who provides the 'story or problematic situation' and facilitates or coaches the students to go through the process of problem solving through scaffolding. Learners generate new knowledge and thus, learn to become engaged learners and active problem solvers in real life. In the effort, the concept of Physics is discovered and various human interactions like discussions, group-work, taking leadership, conflict handling, comprehension of verbal communication, and honesty in expressing views develop both interpersonal and intrapersonal skills. CTEAI attempts to unite the six constructivist instructional strategies, namely Situated Learning, Problem-based Learning, Collaborative/Cooperative Learning, Goal Based Scenarios, Blended Learning, and Concept-centered Learning. CTEAI consists of six stages (Baumbach et al., 1995), that are: Phase One - Introduce the anchor; Phase Two - Develop shared experience around the anchor; Phase Three - Expand the anchor; Phase Four - Use knowledge as tools for problem-solving; Phase Five - Work on projects related to anchor; and Phase Six - Share what was learned.

2.1.1.2 Lecture Method

Lecture Method is considered as one of the oldest and commonly used methods of teaching used in Physics, where the teacher provides all scientific information, concepts, and principles to students verbally to a large group of passive listeners. Being a teacher-centered and information-centered approach, one-way communication occurs between students and teachers. Students are inactive in class with minimum or no scope for involvement and interaction. The control of the class lies in the hands of the teacher with no scope for basic scientific processes like experimentation, discussion, and problem-solving.

2.1.2 Learning Styles

In simple terms, learning style refers to an individual's preferred mode of gaining knowledge. It is an individual's unique approach to learning based on his strengths, weaknesses, and preferences. Learning styles also refer to an individual's natural, habitual, and preferred way(s) of acquiring or absorbing, processing, retaining, and retrieving new information and skills (Felder and Henriques,

1995; Reid, 1995). In the present study, learning style is defined as a set of factors, behaviours, and attitudes that facilitate learning for an individual in a given situation. The present study employs McCarthy's four learning styles. Dr. Bernice McCarthy, convinced that the diversity of learners called for an all encompassing learning cycle, drew on the research of Jung, Piaget, Vygotsky, Dewey, Lewin, and Kolb to create an instructional system that would progress through the complete learning cycle using strategies that would appeal to all learners. This innovative approach was called "4MAT System". McCarthy's learning styles are one of the three elements of 4MAT system.

McCarthy's four learning styles considered in this study are as follows:

- *Imaginative Learners* - who perceive information concretely, process reflectively, feel and watch, seek personal associations, meaning, and involvement.
- *Analytic Learners* - who perceive information by thinking/abstractly, process by watching/reflecting, seeking facts, thinking through ideas; learning what the experts think.
- *Common Sense Learners* - who perceive information abstractly, process by doing; experimenting, building, and creating usability.
- *Dynamic Learners* - Perceive information by concretely/sensing feeling, process by doing.

2.2 Dependent Variable

The dependent variable involved in the study is social skills. Social skills find its existence in Social Constructivism advocated by Lev Vygotsky, which highlights the importance of culture and context in understanding what occurs in society and constructing knowledge based on this understanding (Derry, 1999; McMahon, 1997). Social skills can be described as the tools that enable people to communicate, learn, ask questions, ask for help, get their needs met in appropriate ways, get along with others, make friends and develop healthy relationships, protect themselves, and generally be able to interact with anyone and everyone they meet in the journey of life. These skills enable students to distinguish right from wrong, understand why it is important to do what is right, and make good

choices in their thinking and behavior (Dowd and Tierney, 2005). In the present study, social skills are defined as the ability of a person that enables him to successfully and effectively interact and communicate within his own mind and also with other people or personalities. Social skills are the life skills which enable the secondary school youth to develop social competency, build a strong character, and reach their goal successfully. Therefore, school learning should occur in meaningful context and not separated from it; children construct knowledge in the "real world" and these experiences give the child the cognitive tools and social skills necessary for daily life.

In the context of this study, social skills are broadly divided into two categories, namely Interpersonal Skills and Intrapersonal Skills. Intrapersonal Skills initiate an appropriate reaction and attitude because of the abilities that reside within an individual and aid him/her in problem solving (National Research Council, 2011). Intrapersonal Skills desired in a secondary school student, include Self Management (self control, self confidence, self -esteem, self awareness, coping with stress); Self Motivation (taking initiative, involvement in situation, assertiveness, accepting consequences); Good Personality/character (tolerance, perseverance, humility, forgiveness, trustworthiness, honesty, obedience); Problem Solving (critical thinking, intellectual curiosity, inventiveness, conscientiousness); and Time Management (prioritizing work, deciding time slots, adjusting plans as they change). Intrapersonal Skills are the first step to instigate and improve one's Interpersonal Skills, which are skills one needs in order to communicate effectively with another person or a group of people (Rungapadiachy, 1999). Interpersonal Skills, include Communication Skills (good language command, proper verbal communication, non-verbal communication, assertive communication); Leadership Skills (decision making, risk taking, guidance to others, responsibility, empathy); Listening Skills (alertness, filtering messages, comprehending messages); Conflict Handling (questioning skills, critical mindedness); Flexible Thinking (adaptability to change, negotiation); and Teamwork (collaboration, co-operation, respect for individual difference, support).

Based on the above dimensions of Social Skills, a summative rating scale named Social Skills Test was constructed with a main focus of assessing the level of essential social skills of a secondary school student, which he/she is intended to possess or develop in order to overcome life's social challenges and function smoothly in the society. The test comprised of 60 items in total, represented on a four point Likert scale, consisting of both positive and negative statements. Positive statement responses were scored as Always (4 points), Sometimes (3 points), Rarely (2 points), and Never (1 point). Negative statements were scored vice versa with Always (1 point), Sometimes (2 points), Rarely (3 points), and Never (4 points); total score being 240. In each statement, the respondent rated the frequency of his/her response to the situations in daily life, where he/she is expected to demonstrate a particular social skill. The reliability of the test was analyzed by test-retest method and found to be 0.81, suggesting good reliability.

2.2.1 Digital Literacy

The digital literacy, in this study is defined as the ability of the secondary school student to use digital technology, communication tools or networks to locate, evaluate, use, and create information appropriate to their level. It is measured using 'Digital Literacy Inventory' constructed by the investigator.

2.2.2 Pre-achievement

In the present study, the marks scored by the students in Physics test constructed by the investigator based on the Physics content is essential to study before learning the content selected for the experiment is considered as pre-achievement of the student.

2.2.3 Intelligence

Intelligence is defined as the measurement (metric) of individual differences in behaviours and abilities. In the present study, intelligence is the score obtained by the students on administering the Intelligence Test on "Raven's Progressive Matrices".

2.2.4 Students of Secondary School

Students who are studying Physics as a part of Science prescribed by the Karnataka Board syllabus in IX Standard

are considered as students of secondary school.

3. Statement of the Problem

A study on the Effectiveness of Collaborative Techno-Enhanced Anchored Instruction in relation to learning styles on social skills among students of secondary school.

4. Objective of the Study

To study the main and interaction effect of Instructional Methods (Collaborative Techno-Enhanced Anchored Instruction and Lecture Method) and Learning styles on social skills of secondary school students after partialling out the effect of Intelligence.

5. Hypotheses of the Study

There is a significant difference in the main and interaction effect of Instructional Methods (Collaborative Techno-Enhanced Anchored Instruction and Lecture Method) and Learning styles on social skills of secondary school students after partialling out the effect of Intelligence.

6. Methodology

The present study is an experimental research to study the Effectiveness of Collaborative Techno-Enhanced Anchored Instruction in relation to learning styles on social skills among students of standard IX. This study involved a factorial design. In this design, two independent variables were involved. The first being instructional strategies had two levels - CTEAI and Lecture Method. The second independent variable had four levels out of which three levels, namely Dynamic, Imaginative, and Common Sense learners were considered. Hence, the 2x3 Factorial Design. This design facilitated the investigator to manipulate two or more variables simultaneously, which provided two main effects and one interaction effect. Intelligence was treated as a covariate which was statistically controlled.

The population constituted of all students from Standard IX of Urban and Rural English Medium Schools in Kodagu District studying Karnataka State Syllabus during the year 2017-18, aged 14 to 16 years. Two homogenous experimental groups, each consisting of 103 students were formed randomly by matching their digital literacy, pre-achievement, and socio-economic background. Both the experimental groups were further grouped according to their learning styles, where 80 students underwent CTEAI

and 72 students underwent Lecture Method of Instruction.

The tools used for the study are Digital Literacy Inventory, Pre-achievement Test, Learning Styles Inventory, Test on Social Skills, and an Instructional Package using CTEAI in Physics, all constructed by the investigator. Standardized test named Raven's Progressive Matrices was used to measure Intelligence. The study utilized two way ANCOVA to analyze the data and test hypotheses. The significance level was set to 0.05 levels.

7. Analysis of Data and Interpretation

To study the objective, three null hypothesis were framed and data was analyzed using Two-way ANOVA with intelligence as covariate. The three null hypotheses are as follows:

H₀1: There is no significant difference in the effect of Instructional Strategies on social skills of secondary school students after partialling out the effect of Intelligence.

H₀2: There is no significant difference in the effect of Learning Styles on social skills of secondary school students after partialling out the effect of Intelligence.

H₀3: Interaction effect of instructional strategies and learning styles has no significant effect on social skills of secondary school students after partialling out the effect of Intelligence.

Tables 1 and 2 show the details of the calculated adjusted means of Instructional Strategies and Learning Styles with respect to social skills and the summary of two way ANCOVA for social skills with intelligence as covariate respectively.

Table 2 shows that F ratio (19.1) for Instructional Strategies, for degrees of freedom 1 and 145 was statistically significant. Hence, the null hypothesis, 'There is no significant difference in the effect of Instructional Strategies

Independent Variable	Levels	Adjusted Means
Instructional Strategies	CTEAI	187.37
	Lecture Method	177.45
Learning Styles	Common Sense Learners	180.20
	Dynamic Learners	184.93
	Imaginative Learners	181.97

Table 1. Adjusted means of Instructional Strategies and Learning Styles with respect to Social Skills

Source of Variation	N	SS	df	MS	F	P	Significance at 0.05 Level
Instructional Strategies (A) CTEAI	80	3726.47	1	3726.47	19.1	0.69	Significant
Lecture Method	72						
Learning Styles (B)	152	546.26	2	273.13	1.4	0.65	Not Significant
Methods X Learning Styles (A*B)	152	540.09	2	270.05	1.38	0.30	Not Significant
Adjusted Error		28289.11	145	195.1			

Table 2. Summary of 2x3 Factorial Design ANCOVA for Social Skills with Intelligence as Covariate

on Social Skills of Secondary School Students after partialling out the effect of Intelligence' was rejected and alternate hypothesis was accepted. From Table 1, it is evident that adjusted means of CTEAI Instructional Strategy is greater than Lecture Method of Instruction. Therefore it can be concluded that Collaborative Techno-Enhanced Anchored Instruction is significantly more effective than Lecture Method in developing social skills among secondary school students.

Table 2 shows that the F ratio (1.4) for Learning Styles and F ratio (1.38) for Interaction effect between Instructional Strategies and Learning Styles for degrees of freedom 2 and 145 was not statistically significant. Hence, the null hypothesis, 'There is no significant difference in the effect of Learning Styles (Common Sense, Dynamic, and Imaginative Learners) on social skills of secondary school students after partialling out the effect of intelligence' and 'Interaction effect of Instructional Strategies and Learning Styles has no significant effect on social skills of secondary school students after partialling out the effect of Intelligence' were retained. Since the significance value (P) was found greater than $\alpha=0.05$, it was concluded that there is no significant difference between group variance. Thus, assumption of homogeneity was met. Figure 1 shows the interaction effect of Instructional Strategies and Learning Styles on social skills of secondary students. It is evident from Figure 1 that CTEAI is significantly more effective than Lecture Method among all three Learning Style groups - Common Sense, Dynamic, and Imaginative Learners in developing social skills.

8. Educational Implications

The research findings of the present study envisages a

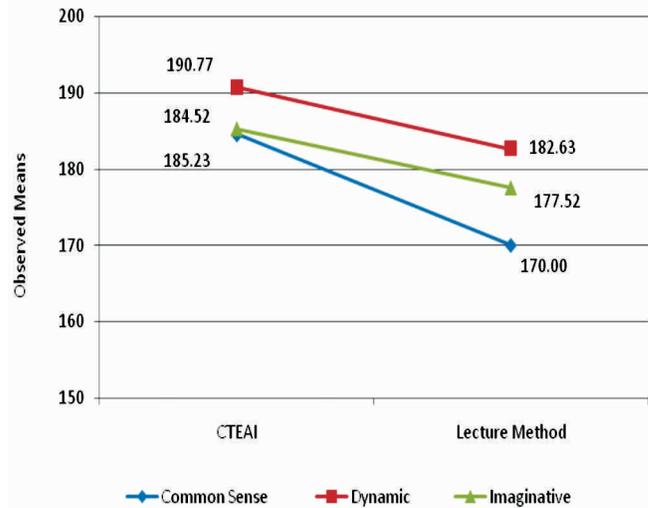


Figure 1. Interaction of Instructional Strategies and Learning Styles on Social Skills

number of important educational implications for teachers, teacher educators, school administrators, educationalists, parents, and for further researches. These results, although show effectiveness at secondary school level, can be extrapolated to primary and higher secondary students when suitably structured.

- Since the study proves that CTEAI promotes the development of social skills against Traditional Lecture Method among secondary school students, the teachers must make sincere efforts to refrain themselves from using traditional teaching methods and readily adopt constructive strategies like cooperative learning, situated learning, goal-based learning, and techno-enhanced learning into teaching-learning process.
- Since CTEAI focuses on collaborative learning in Physics, teachers in class must include activities like group discussions, team based practical work, role-play of social situations, large and small group activities, class games, cross-curriculum activities, incidental teaching, evaluation, and positive comments on daily classroom experiences to develop social skills like cooperation, conflict handling, leadership skills, and communication skills in students. Focus on right attitude towards education and life, self-confidence, and self-management skills will in turn help students to become civilized, socially sensitive, and global minded citizens who know to shape their future constructively.

- As CTEAI involves a lot of digital environment for Physics Instruction, it is evident that technology, when suitably integrated in teaching-learning process, develops social skills in students rather than detaching them from the social environment. Schools must train students how to remain safe in digital environment and to use technology for constructive learning purposes. Schools also must educate parents through seminars and talks to help their children widen their knowledge using educative websites, share their creative academic thoughts and ideas on social issues with experts using social media, and collaboratively work towards social cause.
- Since students with all learning styles are equal in development of social skills, it is vital that more and more efforts must be made by parents and teachers to develop basic social skills like self management, self motivation, good personality, and flexible thinking in adolescents. Parents must develop suitable parenting skills and spend more time with their children in social environment to help them develop these skills. Schools in collaboration with group of schools must create opportunities to link the classroom science education to real-world experiences and social problems, thus finding scientific solutions for problems collectively. Co-curricular activities, extra-curricular activities, likes scouts, guides, NCC, and NSS, assigning classroom jobs and community service will improve students' interpersonal and intrapersonal skills.
- School administrators must try to improve their institutional facilities like digital libraries, Science laboratories, ICT labs, multimedia rooms, etc. and also give liberty for teachers to bring students out of classrooms into real world using field trips, visits to various NGO based organizations to help them develop social skills like taking initiative, involvement in situations, time management, use of assertive language, and taking responsibility.
- Department of Secondary Education must conduct training sessions, workshops, and orientation programmes for in-service teachers on innovative teaching-learning methods to enhance students' social skills. Trainings must realistically emphasize the benefits developing social skills of students.
- Teacher training institutes must train prospective

teachers to experiment with new trends of teaching-learning activities, so that they gain the confidence to use them in their professional life for the benefit of their students.

- Teachers, school administrators, and parents must become role-models for students. They must themselves become a personal example for students by modeling social skills, manners, and characteristics of civilized citizen.

Conclusion

The findings of the present study reveal that Collaborative-Techno Enhanced Anchored Instruction is significantly more effective than Lecture Method in enhancing the social skills among secondary school students. Students of all learning styles are equal in their social skills and there is no interaction effect between instructional strategies used and learning styles on development of social skills among secondary school students. This proves that learning Physics in digital environment gives enough scope for the students to develop important social skills. Strong social skills in present youth is a boon for the society. It is this gift that the students take advantage of throughout their life by becoming a social, civilized, and global minded future citizen. Social skills which the student acquires at young age helps him/her to lead a successful and a satisfying life - both professionally and personally. Students with strong social skills exhibit diligence, persistence, knows to take benefit of new opportunities, and can solve his/her own problems logically. Honesty, integrity, responsibility, and cooperation are some socio-scientific values most expected from educated personnel. Hence, parents, teachers, and schools must shoulder the personal responsibility of developing these important life-skills for the betterment of personal life and development of healthy citizenship of the country.

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