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RELATIONSHIP BETWEEN STUDENT'S SOCIAL INTERACTION AND TRANSVERSAL COMPETENCIES AT ELEMENTARY LEVEL

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Abstract

In recent years, there has been a paradigm shift towards learner-centered pedagogies that emphasize the importance of active student engagement. Holistic personality development and lifelong learning of students is the main cause behind their involvement in learning activities. Transversal competencies serve as foundational skills for lifelong learning which extend beyond subject-specific knowledge and encompass skills essential for success in diverse contexts. As a nation we are interested in development of transversal competencies since inception of Pakistan, but up till now we could not succeed to instill transversal competencies among students. The integration of student's social interaction offers a promising avenue to nurture student's organizational skills, communication skills, teamwork, reasoning, and reflective thinking. This research aims to find correlation between classroom social interactions and development of science-based transversal competencies among elementary level students. Correlational research design is adopted to achieve this objective. Population constituted elementary level science teachers and their intact students at public schools of Rawalpindi. Multistage clusters sampling technique was adopted to reach six teachers and their intact 200 students. Data was collected using two research instruments observation sheet for teachers, observation sheet for students. Data collected from both instruments was correlated through Pearson correlation coefficient. Results showed that involving students in learning by posing contextual questions, waiting for and acknowledging responses, positive and critical participation within classroom conversations, is positively correlated with development of organizational skills, teamwork, communication skills and reasoning, however a moderate level of correlation is found with development of reflective thinking with gradual increase over time. It is concluded that social interaction in classroom is positively correlated with development of science-based transversal competencies. It is suggested that teachers should pose open ended questions in relation to real world situations to encourage students to participate confidently in social interactions for developing competencies.

Keywords: *Student's social interaction, organizational skills, teamwork, communication skills, reflective thinking, reasoning*

Introduction

In the ever-evolving landscape of education, fostering holistic development in students has become a paramount goal. Recognizing the significance of transversal competencies, which extend beyond subject-specific knowledge and encompass skills essential for success in diverse contexts (Muhidova, 2022), this research is designed. Science education takes center stage in shaping young minds, the integration of Students social interaction offers a promising avenue to nurture critical skills such as communication (Smith & Johnson, 2012), teamwork, reasoning, and reflective thinking skills (Silva et al., 2023).

The elementary school phase is a pivotal period in a child's cognitive and social development (Lestari et al., 2023) beyond academic knowledge (Goessling et al., 2023), making it an

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opportune time to instill transversal competencies that serve as foundational skills for lifelong learning (Smith & Taylor, 2019). These school years constitute a crucial period in a child's educational journey (To & Grierson, 2023), where foundational skills are cultivated, setting the stage for lifelong learning and success (Matvienko & Popova, 2022). Hence focus of the study is the exploration of interactive classroom practices enduring student's social interaction that can help in development of transversal competencies students at elementary level.

In recent years, there has been a paradigm shift towards learner-centered pedagogies that emphasize the importance of active student engagement (Sakata, 2023), social interaction is an enriched practice for developing learner-centered approaches (Murphy, Croninger et al., 2022). Social interactions, in particular, provide a dynamic platform for students to explore scientific concepts, share perspectives, and collectively construct knowledge (Bender, 2023). Classroom social interactions, characterized by their dynamic and participatory nature, provide a fertile ground for the cultivation of transversal competencies (Smith & Johnson, 2020). The ability to organize thoughts, manage time effectively, and set priorities emerges as students engage in social interactions that require synthesis and articulation of ideas (Goessling et al., 2023). Moreover, communication skills are refined through active dialogue, encouraging students to express themselves with clarity and receptiveness to diverse perspectives (Chang & Lee, 2018). Student's social interaction in classroom is helpful for development of transversal competencies specifically science-based competencies targeted in national curriculum 2006; which are focused in particular study.

Student's social interaction is conversation between students and teacher in which teacher asks questions to cognitively engage students in learning process (Smart & Marshall, 2013). Social interaction in classroom for development of desired skills demands in-depth and directed back and forth conversation about the topic (Larson, (2022). The collaborative nature of classroom interactions also offers a unique opportunity to explore the development of teamwork skills (Brown & Miller, 2011). Students learn to collaborate, negotiate, and appreciate the collective effort required for shared learning objectives. Concurrently, reflective thinking is fostered (Nguyen & Johnson, 2018) as students critically assess and internalize the information exchanged during social interaction, promoting metacognitive awareness and deeper understanding. Furthermore, reasoning, a vital skill for informed choices, is honed as students navigate discussions, weigh evidence, and contribute thoughtfully to group dynamics (Chen & Wang, 2016). It is imperative to understand how effective discourse within the science curriculum can act as a catalyst for the acquisition of not only scientific knowledge but also the broader skills and dispositions that contribute to a well-rounded individual.

Through a comprehensive scrutiny of existing literature, empirical research it is evident that cultivation of transversal competencies; reflective thinking, organization, communication, teamwork and reasoning is need of the time. By transversal competencies researcher specifically means the skills mentioned in Pakistan national curriculum (2006); organizational skills, communication skills, teamwork, reflective thinking, and reasoning through the facilitation of

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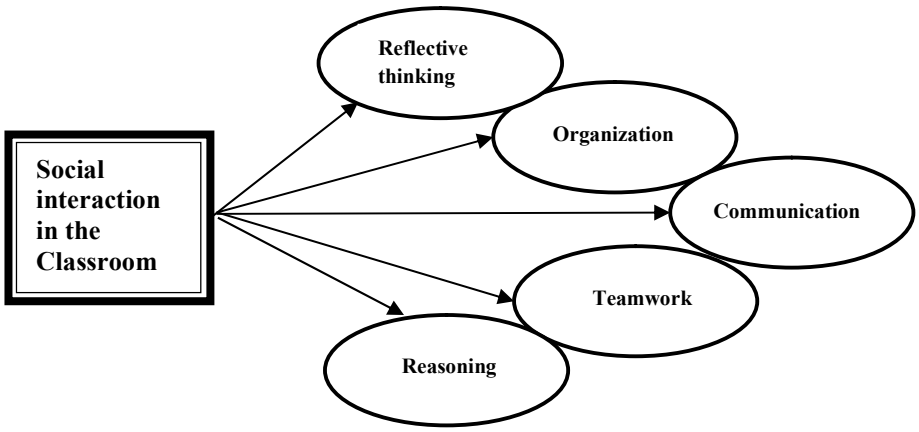
interactive discourse within the classroom. This research holds the potential to inform educators, curriculum designers, and policymakers in refining instructional strategies that intentionally influence scientific interactions to nurture multifaceted competencies essential for the holistic development of elementary level students.

Importance of transversal competencies is evident from each national educational policy, even than we are still in journey towards looking into teaching styles suitable for development of desired skills. It is evident from the science teaching-learning practices in Pakistan that classroom activities are teacher centered and fewer opportunities are provided for students to participate (Panhwar & Bell, 2022). Teachers are less focusing on development of student's transversal competencies instead they focus on transfer of fact-based science discoveries to them. Students overall personality development and preparation for their successful survival in the career, personal and professional lives should be the focus of learning environment (Cheng, 2022).

Figure 1

Concept Map of the Study



Focusing on the demand of developing transversal skills among students at elementary level; this study aimed to explore the strength and direction of relationship between student's social interaction in the science classroom and development of science-based transversal competencies among students. Five science- based competencies that are essential for students to navigate an increasingly complex world are mainly focused here; organizational skills, communication skills, teamwork, reflective thinking, and reasoning. Following research questions are devised to achieve the target of the study;

1. What kind of relationship exists between classroom social interactions and development of organizational skills in science classroom at elementary level?
2. What kind of relationship exists between classroom social interactions and development of reflective thinking skills in science classroom at elementary level?

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3. What kind of relationship exists between classroom social interactions and development of communication skills in science classroom at elementary level?
4. What kind of relationship exists between classroom social interactions and development of teamwork in science classroom at elementary level?
5. What kind of relationship exists between classroom social interactions and development of reasoning skills in science classroom at elementary level?

Methodology

It was a relationship study with a key purpose to find nature or strength of relationship between two variables; elementary level science based transversal competencies and adoption of social interactions within classroom. Frist set of continuous data was collected from teachers using quantified observation checklist and second set of data was obtained from students on observational checklist. Correlation is tested using Pearson *r* correlation coefficient on 0.05 level of significance.

Correlational research design was adopted to explore the nature of relationship between social interaction in the science classroom and development of desired transversal competencies among participant students (Harefa, 2023). This design helps in exploring strength and direction of relationship (Thompson & Nguyen, 2021). Correlation research design is considered suitable for finding the relationship between variables within short period of time without manipulating any of them and when the data collected to infer results is continuous (Gay et al., 2012; Creswell, 2019).

Population and Sampling

Elementary level interactive Science teachers and all the students in their classrooms studying in public schools of a metropolitan city (Rawalpindi) constituted the population of the study.

The desired sample for data collection was made through multistage cluster sampling technique. It is suitable type of probability sampling to select intact groups of interest for collection of data (Gay et al., 2012). Socially interactive teachers involved students in classroom conversations while teaching science at elementary level and their students were key focus of the researcher. Six social interactive teachers were randomly selected from the population along their intact classes constituting around 200 students of elementary level. Hence 6 teachers and 200 students were selected for observation.

Procedure of the study

Six elementary level science classrooms were observed for three months. Transversal competencies-based tasks were given to students for recording developed competencies among them at three points of times with a gap of one month (Özer, 2021). Two research instruments were developed and employed for data collection for this study.

The research was focused on teachers practice made in the classroom and consequent involvement of students in those interactions while teaching science. This measure was recorded through observation checklist of teachers on 5-point rating scale. Teachers were observed

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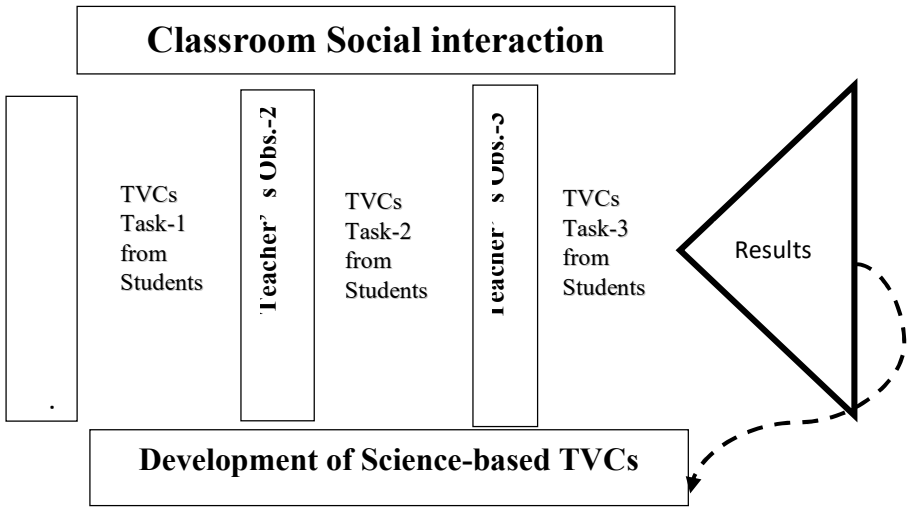
obtrusively during teaching in the classroom. The only purpose of this data was confirmation of the phenomena that they provided students with maximum social interaction opportunities. Second data set was collected from students on 9-point rating scale while they were engaged in performing content free tasks based on science based transversal skills. Nine points were categorized into 1-3 (low), 4-5 (medium) and 6-9 (high) levels of skill's development. This criteria of assessing skills have been suggested by Creswell, (2012) elaborating they can never be zero in any individual. This data set was utilized to measure the level of student's skills development due to maximum social interactions.

Figure 2

Details of Teacher's and Student's Observation during Classroom Interaction



Note. Figure 2 is showing the data collection procedure during class room social interaction, teacher's observation was done at three points mentioned as "observation 1-3" similarly students were engaged thrice in TVCs based tasks 1-3. After task 3 results were compiled.

Instruments

Two instruments were used to dig into the phenomena of relationship between social interaction and development of transversal competencies, they were teacher's observation sheet and student's observation sheet.

i. Teacher's observation sheet

It was developed to rate the observation of teacher's adoption of maximum social interaction in form of classroom social interaction with students. It was a researcher developed observation checklist that was finalized after extensive reading of literature, selection of common sub-factors of social interaction; initiation, direction, argumentation, acknowledgement and focus, and

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indicators of interest. It was validated by five experts of the field and it was pilot tested to get its reliability coefficient was 0.76. Teachers were rated on 5-point Likert scale varying from 5: always. 4: mostly, 3: sometimes, 3: rarely, 1: Never.

Table 1

Scope of the Instrument Used for Recording Teacher's Observation

	Sub factors	Scope	No. of items	α
Classroom Social Interaction	Initiation	Recorded start of classroom interactions from relevant point of interest and instigating students to think and participate.	04	0.73
	Direction	Recorded teacher's role as a motivator, director and scaffolding agent.	05	0.76
	Argumentation	Practice of Argue and counter argue between classroom participants.	02	0.78
	Acknowledgement	Recorded time to think & recognition of student's response	02	0.76
	Focus	Record of agreement on results	02	0.77

ii. Student's observation sheet

It constituted 9-point rating scale developed by the researcher to rate the level of development of each skill in the student. Their level of development was categorized into low, medium and high (Cimatti, 2016; Phuti et al., 2023). Score 1-3 were rated in accordance with lower level of skill development, points 4-5 were rated in accordance with moderate level of development of desired skill whereas points 7-9 were allotted to the students exhibiting higher degrees of development. It was validated from experts and pilot tested to calculate reliability coefficient that was 0.81.

Table 2

Scope of the Instrument Used for Recording Student's Observation

	Skills	Scope	No. of items	α
Science-based transversal competencies	Organizational	It was employed to record the student's skills of organizing men, material, money and competencies to achieve target	13	0.81
	Reflective thinking	It was employed to assess rightness and		

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	relevancy of the past situations considered, linking with current concept	11	0.83
Communication	It was used to assess legibility, correctness and suitability of the terms used, nature of words, sequence and clarity of the sentence of students	17	0.78
Teamwork	It was used to record the students competency of working within groups for common targets	15	0.80
Reasoned-decision making	Relevancy and sequence of the reasons given for selecting any solution among possible was measured through this instrument	09	0.82

Transversal competencies based tasks for students

Content free transversal competencies based task were developed after extensive reading of literature and discussions with subject experts. These tasks were designed specifically for creating environment for data collection. Tasks were executed within the classroom before and after specified time duration encompassing couple of activities for students to get involved taking help from the point of views of some studies like; Llopis-Albert and Rubio (2021); Bratu and Cioca (2021) and Eadie et al. (2021).Tasks comprised predefined scoring criteria for each activity completed by student individually or in groups. Students were given opportunity to communicate on given tasks before writing responses. Their science based skills were observed and rated on observation checklist parallel to the task performance. Validity of the task were ensured by five science subject specialists.

Table 3

Conceptual framework of TVCs Based Tasks

Assessment			
Task I & II	**Performance**	**Skills**	**Tool/s**
Content Free Task	Students task focused conversation	Teamwork Organizational Communication	Observation
		Reflective thinking reasoning	Written Response

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Results and Interpretations

Table 4

Teachers Performance during Classroom Social Interactions

Sr#	Indicator	Statement	Min	Max	$\bar{X}$	SD
1.	**Initiation**	Raised situational question	3.0	5.0	4.80	.60
		Initiated session with question	2.0	5.0	4.80	.68
		Allowed students to question	3.0	5.0	4.93	.36
		Encouraged participation	2.0	5.0	4.72	.80
2.	**Direction**	Motivated student support	3.0	5.0	4.67	.60
		Kept students focused	3.0	5.0	4.37	.71
		Open interaction was allowed	4.0	5.0	4.75	.44
		Students concluded	2.0	4.0	3.43	.74
		Teacher concluded	4.0	5.0	4.75	.44
3.	**Argumentation**	Student's argued	1.0	4.0	2.83	.84
		Welcomed counter evidences	2.0	4.0	3.08	.74
4.	**Acknowledgement**	Waited for response	3.0	5.0	4.37	.93
		Confirmed student's response	3.0	5.0	4.90	.44
5.	**Focus**	Reached common results	3.0	5.0	4.80	.60
		Together reached consensus.	3.0	5.0	4.77	.64

Teacher's performance during teaching through social interactions is given in table 4. Data shows that 4.93 (SD= .36) of the teachers allowed students to participate in the class by asking as many questions for their clarity as they wanted during learning to increase student's participation. Teachers created situation and raised contextual question 4.80 (SD= .60 & .68 respectively showing maximum teachers were inclined towards creating excellent and prompt contextual situation, matching to the mental level of the students. Teachers also related contextual situation logically to the class scenario for instigation of student's cognition and asked relevant questions to start a well-directed social interaction in the class. Both actions of teacher's allowed students to participate freely in social interaction and to conclude session by their own 4.75 (SD= .44). Teachers encouraged maximum students to participate in conversation for concept clarity but teachers preferred to conclude discussion's outcome by themselves. Mean value of 4.67 depicts teacher's role as motivator and facilitator in the class for students to involve their peers in learning classroom interactions. Relatively lower mean value (3.43) portray that

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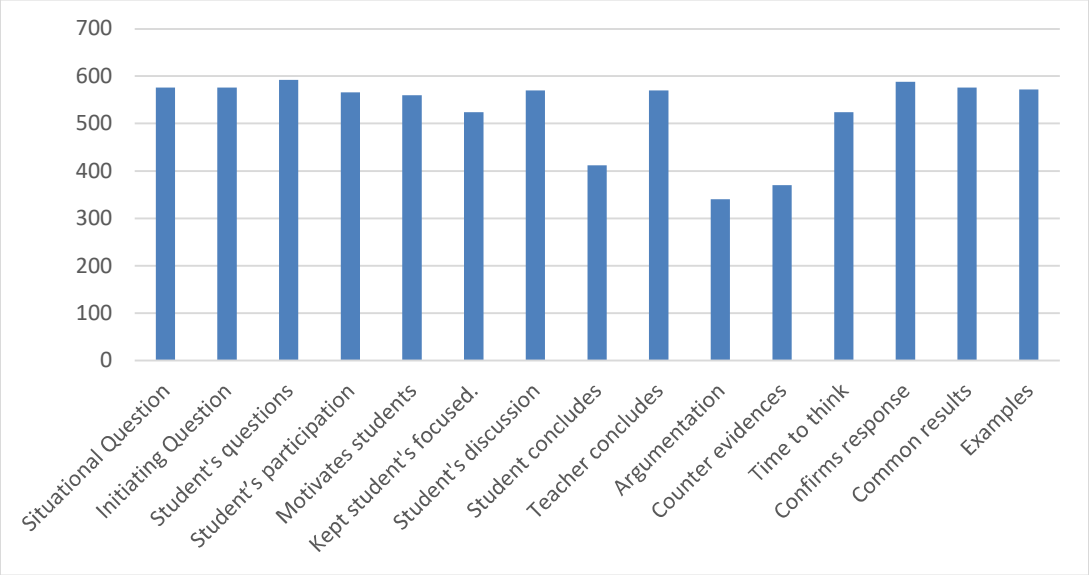
teachers hardly liked to allow students to conclude the session, in order to provide students with most relevant and elaborated conclusive remarks for their understanding.

Teachers 4.90 (SD= .44) gracefully recognized and elaborated the student's response without creating mess, to make them feel the importance of their participation and encouraged them to stay attentive during scholarly conversations and participate fully. Class participant's (4.80, SD= .60) focused on reaching common results after communication elaborate their interest to reach an agreement after sharing clear, consistent, coherent and persuasive ideas while conversation within science classroom at school level.

Results showed that teachers offered a conducive environment to the students by allowing open social interaction. They excellently and promptly created clear and contextual learning situation. They invited students for participation by asking questions, giving smooth gesture while responding their arguments and responses. Focus remained on maximum attentive, active and productive participation of the students to reach agreement about the concept under consideration.

Figure 3

Weighted Score Obtained from Classroom Social Interaction



Note. Figure 3 shows teachers were practicing maximum indicators of classroom social interactions while teaching science to the students. They scored above 500 on maximum of the indicators however they were somewhere (weighted score= 350) welcoming students' counter arguments and counter evidences. Relatively lower score is obtained by teacher's practice of allowing students to conclude at end of the session.

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Figure 4

Students Engaged in Collaborative Classroom Activities

Note. Figure 4 is showing some pictures taken from science classrooms in which students are engaged in collaborative learning activities with peers. Provision of such opportunities to school students during learning allows them to think critically and get cognitively engaged in learning. It also enhances their learning aptitude, sense of responsibility, organizational skills and dealing in teamwork. Pictures are blurred to ensure the anonymity of student's participating in study.

Table 5

Nature of Relationship between Social Interaction and TVCs Development Task-I

TVCs	Classroom Social Interaction	
	Pearson Correlation	**Sig.**
Organizational skills	.671**	.002
Reflective thinking skills	.056	.824
Communication skills	.605**	.008
Teamwork	.574*	.013
Reasoning skills	.520*	.027

Table 5 is showing data regarding correlation between classroom social interaction and development of transversal competencies which were focus of the researcher. Development of organizational skill and adoption of social interaction are positively correlated (.671**), adoption of social interaction significantly (.002) affected the development of organizational skills among elementary level students. Development of communication skills also shown a positive

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correlation (.605**) with adoption of social interaction and proved significant (.008) at 0.01 level. Data shown that development of teamwork (.574*) and reasoning skill (.520*) is positively and significantly correlated (.013) and (.027) respectively at 0.05 level.

Table 6

Nature of Relationship between Social Interaction and TVCs Development Task-II

TVCs	Classroom Social Interaction	
	Pearson Correlation	**Sig.**
Organizational skills	.697**	.001
Reflective thinking skills	.176	.624
Communication skills	.695**	.002
Teamwork	.647*	.033
Reasoning skills	.590*	.016

Table 6 is showing relationship between social interaction and TVCs based on the data collected from students by task-II. Results showed that there is gradual increase in the developed skills among students when data was collected on a second point. Organizational skills shown a moderate positive correlation (.697**) with classroom social interactions that was .671** after task-I. Similarly from 605** communication skills shown a bit high positive correlation (.695**) with social interaction after task-II. This gradual increase can also be observed in other skills development as well.

Table 7

Nature of Relationship between Social Interaction and TVCs Development Task-III

TVCs	Classroom Social Interaction	
	Pearson Correlation	**Sig.**
Organizational skills	.761**	.000
Reflective thinking skills	.305	.342
Communication skills	.730**	.001
Teamwork	.746**	.008
Reasoning skills	.650**	.008

Table 7 is showing relationship between social interaction and TVCs based on the data collected from students by task-III. It is evident from the results data collected after third observation and

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assigning third task to the students that all of the skills of interest has shown gradual increase in development and shown positive high significance with adoption of social interaction at elementary level for development of transversal competencies among science students.

It is interpreted from the results obtained that, if teacher adopts social interaction while teaching General Science at elementary level it eventually accelerates the development of transversal skills among students. Element of conversation enhances the development of organizational skills, communication skills, teamwork and reasoning skills. Students taught through social interaction develops mentioned skills. It can also be said that if element of social interaction is controlled or minimized the students development at focused transferable skills would also be halted. On the other hand data showed that development of reflective thinking skills in students had a very low level of positive correlation (.056) with adoption of social interaction at task –I, whereas on second and third data sets student's reflective thinking gradually increased. Hence without concerning its degree of development or correlation it can be concluded that development of reflective thinking is a slow but perpetual process if it shown positive correlation than it will develop gradually with consistent adoption of social interaction while teaching science subjects.

Discussion

The findings of this research provide compelling evidence supporting a positive correlation between classroom social interaction and the development of science-based transversal competencies among elementary level students (Smith & Johnson, 2020). The implications underscore the significance of social interaction in fostering a multifaceted skill set (Garcia & Turner, 2023) that extends beyond the boundaries of traditional subject-specific knowledge.

One of the noteworthy findings of this study is the positive impact of social interaction on communication skills, stated finding is consistent with the findings of Smith and Johnson, (2012), Rodriguez and Thompson, (2015). The dynamic exchange of ideas within the science curriculum not only enhances students' understanding of scientific concepts but also cultivates their ability to articulate thoughts, ask probing questions, and engage in meaningful dialogue. As communication is a transversal competency essential for success in various aspects of life, the observed positive correlation suggests that intentional integration of social interaction within science education can serve as a catalyst for enhancing students' communication abilities, this is aligned with the findings of Brown and Davis, (2014) and Chang & Lee, (2018).

Moreover, this research highlights a distinct positive correlation between classroom social interaction and teamwork corroborated with the point of view of Johnson and Williams, (2008) and organizational skills development consistent with the findings of Martinez and Smith, (2009). The collaborative nature of science-based social interaction encourages students to work collectively, share responsibilities, and appreciate the diverse perspectives within the group. These experiences contribute to the cultivation of teamwork and organizational skills, essential transversal competencies that extends beyond the science classroom into future academic and

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professional endeavors; this finding is supported by Brown and Miller, (2011) and Kim and Lee, (2010) respectively.

The positive relationship between social interaction and the development of reflective thinking and reasoning skills is another key aspect illuminated by our research. Through active participation in science-based social interaction, students are exposed to a variety of problem-solving approaches, critical thinking strategies, and the ability to analyze and synthesize information. This engagement not only enriches their scientific understanding but also lays the groundwork for transversal competencies (Wu, 2016; Webb et al., 2015; Ngwenya et al., 2022) associated with reflective thinking already enlightened by Smith and Jones, (2015) and Nguyen and Johnson, (2018) and reasoning in diverse contexts this point of view is an extension of Chen and Wang, (2016) and Turner and Garcia, (2017).

Furthermore, the positive correlation observed in the development of transversal competencies is noteworthy (Smith & Johnson, 2020; Nguyen & Wilson, 2022). Engaging students in social interaction within the science teaching equips students with the ability to navigate and evaluate information critically (Craşovan, 2016; Kutbiddinovaa et al, 2016; Ndlela et al., 2020; Wu 2021). In conclusion, the findings of this research provide compelling support for the positive correlation between classroom social interaction and the development of science-based transversal competencies (Davis & Martinez, 2021, Garcia & Turner, 2023) among elementary level students.

Recommendations

1. Policy makers should start with clearly defined transversal competencies required to be developed at each grade and alignment of stated skills with unit instructional objectives of teaching science and content being compiled.
2. Teachers should encourage active listening, respect for diverse perspectives and constructive feedback while teaching science. Student's holistic development requires to foster a classroom culture where students feel comfortable expressing their ideas.
3. Teachers should divide students in small groups to encourage teamwork, assign roles within the group as note-taker, timekeeper to ensure students focused participation.
4. Teachers must connect science concepts with contextualized real world problems to make them understandable for students and providing the social interaction forums or collaborative platforms to extend beyond the classroom.
5. This research focused at one level of students to explore the role of social interaction on development of student's transversal competencies, more research studies for different levels should be designed and conducted to dig into the effective dimensions of using social interactions in the classroom.
6. It is also suggested to expand similar research in different contexts and subjects to validate effect as well as the impact of the social interactions on student's life and its implications in future careers.

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