Assessing the Effectiveness of Interaction Approach in Learning about Rivers among Grade IXStudentsin Geography

ABSTRACT

This study investigatedthe effectiveness of the interaction approach (IA) in learning about rivers among the ninth grade students of a middle secondary school in western Bhutan. The study adopted the mixed-method explanatory sequential design. The quantitative data were gathered through a quasi-experiment, involving pre-test and post-test on Geography achievement tests (GAT) for both the control and experimental groups (EG)and survey questionnaireswere administered to gather the perception of students from the EG.Additionally, structured interviews were employed to gather qualitative data from an equal representation of genders within the EG.

The GAT scores consisted of two sections viz. the CG (*N*= 34) and the EG (*N* = 34). In this study, a targeted sample selection was made with a sample size of 68 students. The analysis of the independent t-test to compare between CG and EG showed a statistically significant difference ($P < .001$) in post-test for both CG and EG. Similarly, a paired-sample t-test was conducted for comparative analysis. There was a statistically significant difference ($P < .001$) between the pre-test and post-test results of the CG ($P = 0.05$) in the students' learning achievements with the post-test. Likewise, the EG shows a statistically significant difference ($P < .001$) between the test scores in the pre-test and post-test.

The results of the study confirmed that using the IA improved students' GAT scores compared to the conventional teaching method. The descriptive analysis of the study also indicated that students have positive perceptions towards the use of IA in learning of river in Geography. In addition, the study also revealed higher perceptions of the themes of self-confidence, motivation and collaboration when using IA, which was further supported by student respondents' positive perceptions of the benefits of IA. However, when using IA, the large class size pose a challenge as perceived by students. In conclusion, this study recommends Geography teachers to use IA as an intervention approach to stimulate students to learn about rivers effectively. These predictors, however, need further work to validate its reliability.

Key words: Cooperative learning, Interaction Approach, conventional method, Geography Achievement Test, student perceptions

1. INTRODUCTION

Modern education in Bhutan was introduced by the first King GongsarUgyenWangchuck in 1914 [46].Likewise, Sherab[46] reiterates that monastic education was taught in Dzongs and villages. School teachers were trained in the application of teaching methods during the training period. The study also mentioned that teachers resorted to the conventional method that is: use of chalk and chalkboard, repeated use of teaching aids and teacher talk/teacher reading. This made learning tedious and redundant for the students thereby making them passive learners. As a result, students learned less and were late in learning. The education system in Bhutan strives for academic achievement in students, quality teachers and exposure to new pedagogical approaches so that learners can fully benefit.

Cooperative Learning (CL) is the new pedagogical approach recently introduced by the Ministry of Education (MoE) into the teaching-learning process in the Bhutanese education system. According to Jolliffe[25], CL requires students to work together in small teams to support each other in order to enhance students' learning. Doolittle [15] pointed out that the components of the CL approach are; positive interdependence, face-to-face interaction, individual accountability, and skills for small group and interpersonal relationships.

Therefore, in order to fulfill students' learning, students must work in teams and these components are needed in the class lessons. The use of different pedagogies by teachers is essential in a 21st century classroom as teachers need to be updated with CL strategies. A component of the CL approach used in this study was the Interaction Approach (IA). The IA within CL refers to group members supporting, assisting, influencing, motivating, trusting, and challenging other group members to facilitate the achievement of the group goals [15]. Learning does not take place in isolation. Learning requires interaction and this requires not only interpersonal skills, but also communication skills [25].Further, Sherab[46]suggested that in order for students to learn lessons effectively, the teacher must also move and use a variety of interactions with students. Therefore, students' learning can be achieved by interaction. This study was an attempt to use IA as a CL strategy to get students to learn about rivers effectively.

1.1 Problem Statement

Several studies have examined approaches to learning in the classroom and found that today's students learn more, retain more, and are more successful when CL methods such as IA are used in the classroom as opposed to conventional learning methods[43,38]. There are important aspects to the effectiveness of using IA as CL in Geography teaching.Teachers across the country were taught to use the teaching methods learned at teacher training colleges. A study conducted on the quality of education found that there are still teacher-dominated lessons with less democratic process and less autonomy in learning [46]. This proves that many still use the conventional teaching methods or the lecture method. On the other hand, two teacher training colleges in the country conducted training for teachers on the use of teaching strategies during the training period. As part of the CL strategy, IA must be used by the teacher while students are learning in the classroom. In 2016, the MoE offered training for teachers on pedagogical approaches that emphasized on the application of 21st century classroom pedagogy for all teachers across Bhutan as part of the program 'Transformative Pedagogy'.

Moreover, the Bhutan Education Blueprint [6] found that there are gaps in the students' learning outcomes, classroom practices, school processes, and educational support systems. This is intended to replace the use of conventional teaching methods used by teachers. The IA enables students to learn better, adopt positive attitudes toward each other, the school, and the teacher and improve their self-confidence [31]. The IA is a learning method in which small groups of learners work together while educators act as facilitators [50]. As facilitators, teachers can facilitate student learning through appropriate monitoring, feedback, and answering doubts.

A study on English language in Indonesia concluded that students acquire language through interaction with others, teachers and students [47]. The study also found that the teachers described the students' response in the interaction as influenced by various factors, such as level of proficiency, character, intelligence, self-confidence and motivation. A similar study by Aydin and Coskun[4] suggested using interaction strategies such as extended learner turns, short teacher turns, minimal repair, content feedback, referential questions, scaffolding, and clarification requests for effective student interaction. As teachers, it is important to incorporate these interaction strategies so that learning becomes interactive and interesting. There is some research in mathematics and science subjects to find out the effectiveness of different pedagogies. However, there is limited research on the effectiveness of using IA in learning ofGeography in the Bhutanese classroom. As transformative pedagogy training has been provided to educators nationwide, there arises a need to investigate its implementation and efficacy. A gap exists in understanding the proper utilization of these pedagogical approaches and their level of effectiveness.Therefore, this study used IA as an intervention to assess its effectiveness in the classroom, which would serve as a basis for further research.

1.2 Research Questions

Primary Question: What is the effectiveness of the Interaction Approach in students' learning about rivers in Geography?

Sub Questions:

1. Is there a significant difference in the students' learning about rivers between the control and experimental groups?

2. What are the students' perceptions of learning about rivers through the classroom interaction approach?

3. What advantages and challenges do students experience while learning about rivers through the interaction approach?

2. LITERATURE REVIEW

2.1 Overview

The existing literature was reviewed based on the assessment of the effectiveness of the Interaction Approach (IA) in learning about rivers among ninth grade students. The most important component in this chapter provides an overview of Cooperative Learning, the historical approaches related to IA and the theoretical framework. Then, the importance of IA and its advantages over conventional teaching methods in classroom instruction are presented. Finally, it summarizes the literature review on the assessment of the effectiveness of IA.

2.2 Cooperative Learning and Historical studies of Interaction Approach

2.2.1 Cooperative learning

CL and historical studies of Interaction Approach This section provides a brief overview of cooperative learning and the historical studies of CL and IA in Geography classrooms. Teachers have used the CL approach in schools and have proven successful throughout research history. CL is a collection of concepts and techniques that help maximize the benefits of cooperation between students [24].Additionally, CL is a systematic model to help teachers implement and work with teams so that students consistently: learn the material, complete assignments, and involve all team members in their work, solve team problems with minimal support from the Teachers resolve, resolve differences among themselves and enjoy the cooperative process[47]. CL originated in the United States in the early 1970s. It was proposed by American educators Robert E. Salvin, David W. Johnson, and Cathy N. Davidson [52]. CL was introduced to teachers in Bhutan by MoE in 2016 through transformative pedagogy. It was a week-long introductory and training course on CL. The training was rolled out as a professional development program. It has also been mentioned that CL is a breakthrough complement to conventional classroom teaching as an efficient teaching approach that can improve learners' cognitive abilities and enhance their language use skills [52].

Kagan[26] defined CL as a Set of processes that help people interact with each other to achieve a specific goal or develop an end product, usually content-specific. This study is designed to organize team building through real, meaningful, and fun activities that lead to more efficient academic work that helps students further develop communication skills in Geography. The background for this study is based on Spencer Kagan's theory on CL. This theory posits that team building, as the name suggests, is the process of building teams. Team building is not just about bringing students together to work, but about making a cooperative and caring team out of a group of students from diverse backgrounds and experiences [26]. CL means that students are asked to do something in teams or to work in teams. The teacher will ask the students to form teams and give lessons for discussion in teams. While the students

are discussing, the teacher looks around to check the students' activities. The CL is an effective way to encourage students to actively interact in the teaching-learning process. Furthermore, the class structure itself abandons the sequential organization of the class and adopts a concurrent structure that allows for interaction among students. Students have the opportunity to speak in pairs or in teams.

In the 1960s, British educators emphasized the importance of language throughout the curriculum [7]. The research was conducted on the questions asked by the teacher and the types of students' conversations generated in various subjects in first-education classrooms, including math, science and humanities subjects. Comparisons were also made between home and school conversations, showing that the latter was impoverished compared to the former. Features of home speech that helped children learn how it meant were identified, such as janitorial language, scaffolding, exploratory talk conversations and collaborative construction of meaning. These results have provided insights into classroom interaction research in language learning [39]. The components of the CL approach are positive interdependence, face-to-face interaction, individual accountability, and small group and interpersonal skills. This makes it clear that IA is also used in Geography lessons. This study on assessing the effectiveness of IA in students' learning about rivers among grade 9 students at a middle secondary school in western Bhutan provides insights to determine this.

2.2.2 Historical studies of interaction approach

According to Raluka[41], IAare modern ways to stimulate teaching and are learning tools that encourage the exchange of ideas, experiences and knowledge. Interactivity is characterized by the desire for active cooperation and participation with a deep active-participatory character. Learning is achieved through communication and collaboration. It is based on mutual relationships and refers to the process of active learning in which the learner acts on information to transform it into new, personal and internalized information. Constructively, the learner rebuilds their senses by exploring the educational environment, solving problems or using the information gained in new situations. Interactive learning represents an evolutionary process based on receptivity to new experiences sought to be resolved through exploration, deduction, analysis, synthesis, generalization, abstraction, and concretization [41].

Giorgdze and Dgebuadze [16] support that an IA involves a dialogue mode interaction. In other words, an interactive teaching method is a form of learning and communicative activity in which students are involved in the learning process and reflect on what they know and what they think. Contrary to the conventional method, the primary function of teachers in implementing IA is to support and facilitate through interactive learning that further focuses on students' needs, abilities, and interests. In a conventional teaching approach, the teacher is at the centre of the learners and the learners are passive and only receive information. On the contrary IA is a learner-centered system in which the teacher and the learner swap their traditional roles, allowing the learner to actively participate in the learning process and be the center of the classroom [16]. Therefore, based on the knowledge and experience of teachers; learners categorize, analyze, adopt opinions, acquire new skills and develop attitudes towards facts and events.

2.3 Interaction approach as perceived through self-confidence, motivation and collaboration

2.3.1 Self-confidence

Lauster[33] explained that self-confidence is an attitude or a feeling of confidence in one's abilities, so that the person concerned is not overly anxious in his actions, can feel free to do what he wants and is responsible for his actions. An individual with self-confidence is warm and polite in interacting with people and have the urge to surpass oneself. A lack of self-confidence causes students to run away from the problems at hand. According to Rubio [45], low self-confidence can lead to some psychological conditions such as feelings of insecurity, fear, anxiety and antisocial behavior. This can also be the case in geography lessons. A person who lacks self-confidence will most likely have a negative bias toward the course and the classroom. A student will have constantly negative feelings during class such as fear of failure, inadequacy, fear of humiliation, and fear of the teacher and the course and will refrain from speaking and participating in class activities. Such students fail to socialize properly and refrain from speaking in the classroom [18].The teacher is the hallmark of the classroom by creating an environment

in which each student feels self-confident. As Hayrettin [18] further noted, classroom environments in which students can answer questions without hesitation and express themselves without fear or fear of failure or humiliation at the hands of their teacher, even if they make a mistake, foster their self-confidence. Encouraging students to act and speak correctly, to give them feedback - especially positive feedback- and to offer them fun classroom activities can boost their self-confidence. There was a correlation between classroom and self-confidence, and there was a strong correlation between a person's self-confidence and the social group they are in [9]. Therefore, in a Geography class with high-confident students, a student's self-confidence can be boosted.

2.3.2 Motivation

According to Aydin and Coskun[4], motivation is the desire to achieve a goal that is meaningful to a person. Motivation attempts to explain why students choose to do something. Isik et al. [23] has identified the factors influencing student motivation as follows; the effectiveness of the teacher and friends, individual attitudes towards the school, students' perceptions of their abilities, previous experiences - positive or negative, importance attached to students' success, parents' attitudes towards their children and the School conducted with the research in mind. Furthermore, Aydin and Coskun[4] stated that highly motivated students enjoy doing challenging exercises and answering difficult questions in order to repeat the chances of the remaining unsolved cases. Low-motivated students are needed to ensure knowledge success and increase motivation by moderating the difficulty of content and questions. Motivation is therefore an essential factor in learning Geography lessons.

2.3.3 Collaboration

According to Head [20], collaboration is a process that can be used to support learning, and effective collaboration is an integral part of the learning process itself. In a theoretical explanation of how effective collaboration works, Head [20] used further interpretations of Vygotsky's zone of proximal development. The value of collaboration is therefore twofold. It offers individuals the opportunity to move beyond the functional aspects of coordination, collaboration and communication to the collective aspects. It thus follows that some things can only be achieved through group activity. Therefore, in order for educators to behave professionally and efficiently in ensuring the quality of the educational experiences for their learners by ensuring that their own learning experience is as fruitful, inclusive and enjoyable as possible, it becomes not only desirable but imperative that they collaborate effectively[20]. Al-Zahrani[3] suggests that student interactions between groups of students encourage collaborative, critical thinking, communication skills, and hands-on-experience. By providing students with in-classroom discussions and hands-on problem-solving opportunities, students were able to learn and contribute different viewpoints and approaches of their teammates as well as explore a wider range of possible solutions to class assignments. Crouch and Mazur [14] also suggest that collaborative efforts are strengthened by the diverse knowledge, experience, and perspectives that each student in a team brings to the team. This, in turn, further strengthens the learning outcomes of collaborative team environments.

2.4 Advantages of Interaction Approach (IA)

According to Giorgdze and Dgebuadze[16], IA helps shape the learning process in such a way that all students are equally involved in the cognitive process, each individual contributes to the teaching process, and students exchange information and ideas. This relationship allows students not only to acquire knowledge, but also to develop communicative skills: the ability to listen to others, evaluate different points of view, participate in discussions, make joint decisions, and develop tolerance. This is supported by Kagoda[28] that using IA facilitates group discussion and students become aware of their inhibitions, defenses and assumptions. This allows students to see other students' difficulties and help them to overcome them. Students learn to become more sensitive to different perspectives and ways of thinking and to work cooperatively with others, using the diverse skills of the group. One method is to discover the opportunity of peer learning and socialization as this may not be possible in the usual lecture method.

2.5 Challenges of the Interaction Approach (IA)

Using IA presents numerous challenges. The challenges that teachers and students face when using participatory methods which are attributed to the lack of teaching materials, are consistent with Luchembe[34]who claim that the environmental situation and the location of schools are the challenges that impede the effective use of interaction. Furthermore, the study conducted by Ayeni and Olowe[5] in Ghana found that the students were neither organized nor participating effectively in the relevant classroom activities as a large number of students exceeded the classroom capacity in most schools. This is detrimental to the effective implementation of the learner-centered approach, particularly the classroom management of learner-centred methods by teachers, which require close teacher supervision. The situation also applies to the Bhutanese classrooms, where there are a large numbers of students with a minimum teacher-student ratio of 1:25. This affects the effectiveness of the interaction as a whole-class approach [47].

2.6 Conventional Methods of Teaching

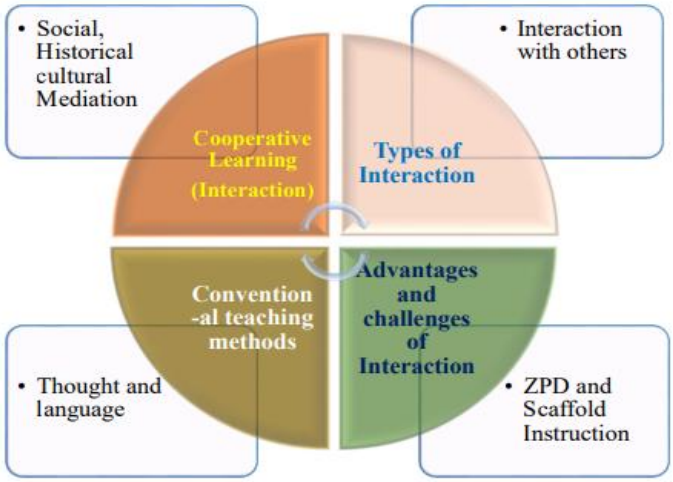
The evidence cited by Sherab[46] shows that teachers still use the conventional teaching method and there is little interaction between teachers and students. Of course, the teacher usually spends a lot of time talking and explaining the lesson plan. Students are required to sit passively in their seats and listen carefully to the lecture. Students tend to memorize concepts, memorized vocabulary, and translation skills from textbooks [46,52]. In conventional approaches, the teacher talks a lot and guides the students' learning. The learning process in conventional teaching is only one-way communication. Students passively receive what the teacher directs. There are fewer discussions and activities among peers. There are no instructions for cooperative skills. In order to achieve high scores, and individual goals, an individual competition is essential. As a result, students become more selfish and negatively dependent on each other. Conventional teaching is also a question-and-answer session for the whole class, which often reinforces conversation between the teacher and the performers while the rest of the class is indifferent [27]. The teachers who gave the lecture emphasized practice in translation and memorization. A study conducted by Hurst et al. [22] found that less than 20 percent of conventional instruction is devoted to language production and there is a gradual lack of creativity, interaction and critical thinking.

2.7 Interaction Approach and Geography Achievement

Researches have been conducted on the effectiveness of IA under CL, which depict student learning achievement. Some of the studies are listed in this section. Yangzom[53] conducted a study with 128 Bhutanese grade 10 students of TrashiyangtseDzongkhag in Eastern Bhutan to examine student performance in Geography. The mean difference between the pre-tests of the experimental and the control group was 1.03. The significance value (*P*) of the pretest was 0.18, indicating that the results in the pretest of both groups were not statistically significant. Thus, the learning ability of both groups was similar at the beginning of the experiment. A similar finding by Li and Zhang [36] found that the pre-test was not statistically significant at (P = 0.94), indicating that pre-intervention learning ability was consistent. On the other hand, Liu [37] found that the experimental group's post-test scores (M = 35.95) were significantly higher than the control group's mean post-test scores (M = 17.56). Therefore, this suggested that IA improved performance scores compared to conventional teaching methods [53].

A study conducted by Syaefulloh and Sumunar[49] found that an average of 36 students in a secondary school increased performance outcomes treated with an interactive approach higher than the class treated with the conventional method. Another study by Huang et al. [21] showed that interactions between peers and between teachers and students were effectively increased. Furthermore, Yanzom[53] concluded that the mean post-test score was 19.81 and 23.59 for the control and experimental groups, respectively, which was above average. The experimental group showed a higher mean score than the control group in the post-test. This indicated that the interaction approach increased learners' learning performance compared to the conventional method. Therefore, interactive classroom learning makes it easier for students to understand topics in Geography compared to conventional methods.

2.8 Theoretical framework



**Adapted from Vygotsky (1978)*

Figure 1 *Lev Vygotsky's theory of social development*

Lev Vygotsky's theory of social development has variables such as interacting with others and scaffolding as instruction. According to Vygotsky[51], much of the child's important learning occurs through interaction with a capable teacher. The teacher can model behaviors or give verbal instructions to the child. Vygotsky refers to this as cooperative or collaborative dialogue. The child seeks to understand the actions or directions of the teacher, then internalizes the information and uses it to direct or regulate his or her performance. The IA within cooperative learning refers to group members supporting, assisting, influencing, motivating, trusting, and challenging other group members to facilitate the achievement of group goals. IA is interpreted in the Vygotsky system as social mediation and enculturation. Social mediation involves the acquisition of knowledge and skills through a child's interaction with other children and adults. Vygotsky [51] stated that the fundamental aspect of our psychology revolves around the concept of mediation. Further, Leontiev and Luria [35] found that social mediation plays a crucial role in the acquisition of psychological processes that significantly impact the development of human psychological activity.

3. METHODOLOGY

The methodology section presents the philosophical worldview, research design, paradigm, conceptual framework, sampling strategy and sample size, research tools, data collection procedures, data analysis, data triangulation, reliability and validity.

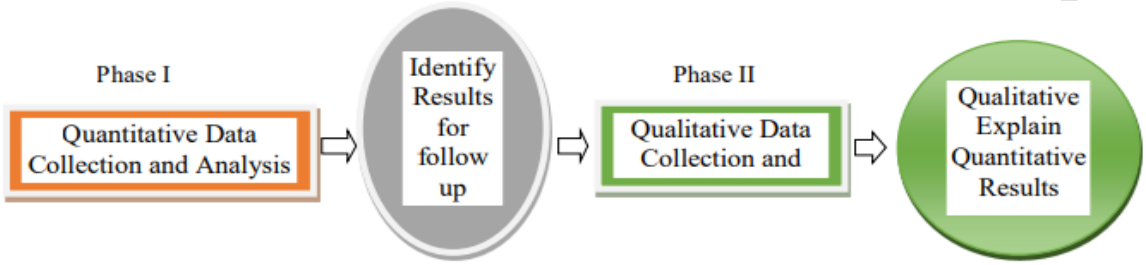
3.1 Philosophical Worldview

The paradigm chosen for this study was pragmatism. Pragmatism refers to an approach that emphasizes practicality and real-world applicability in the design, conduct, and interpretation of research studies [13]. Similarly, the pragmatic perspective acknowledges that research should not solely aim for theoretical advancements but should also address practical problems and provide useful insights for addressing real-world issues[11]. Pragmatism bridges the gap between theory and practice, focusing on finding effective solutions and making tangible contributions to society.

By adopting a pragmatic approach, this research can make meaningful contributions to society, inform evidence-based practices, and address pressing issues faced by individuals, organizations, or communities.

3.2 Research Approach

The study has adopted the mixed methods approach. Mixed methods research is a comprehensive approach to conducting studies that incorporates both qualitative and quantitative data collection and analysis techniques [11].Mixed methods is chosen as its strength of drawing on both qualitative and quantitative research and minimizing the limitations of both approaches [13]. Specifically, the study has adopted explanatory sequential mixed-method design as shown in figure 2. Explanatory sequential mixing methods are those in which the researcher first conducts quantitative research, analyzes the results, and then builds on the results to explain them in more detail with qualitative research.



**Adapted from (Creswell & Creswell, 2018)*

Figure 2.*Explanatory Sequential Design -Two-Phase Design*

3.3 Research Design

The design used for this study was a quasi-experiment and more specifically, pretest-posttest design was employed. In this design, a single group of participants is measured both before and after the intervention to determine if any changes occurred. A pre-test was carried out to determine the equality of the two groups. The pretest ensures group comparability before treatment, while the posttest measures the immediate effects of the treatment on outcome variables. Therefore, EG was exposed to the IA while CG was treated by the conventional method. After completion of the intervention, a post-test was performed to determine the difference between EG and CG.

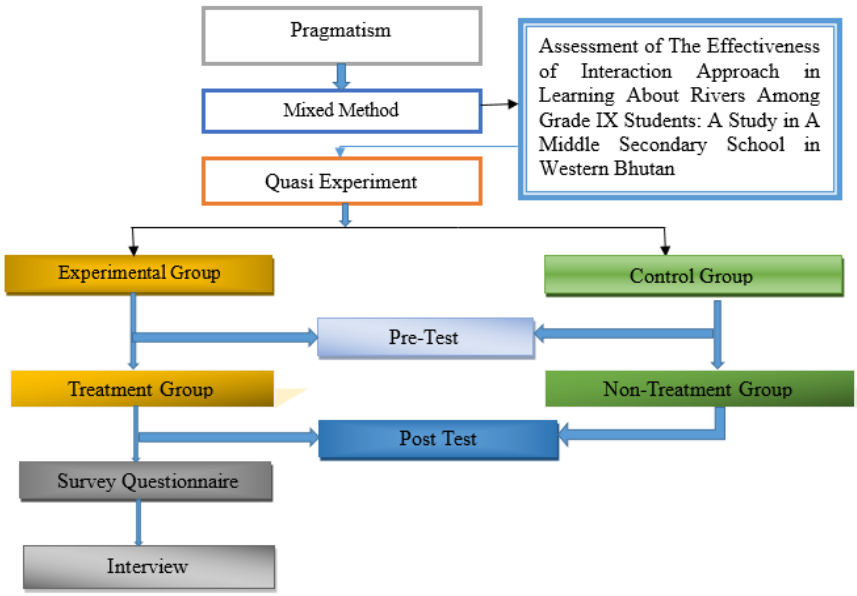


Figure 3.*The Research Design and process of the study*

This study aimed to determine the effect of IA on the mean GAT scores in Geography of a Grade IX students. Therefore, the study was designed as aquasi-experiment where IA is the independent variable, while the mean GAT scores are the dependent variable. The IA is the experimental variable while the regular conventional method was the control condition. The survey questionnaire and interview were only conducted for EG as IA is experimented as the learning approach in Geography.According to Robson [44], an experimental design is used in which the participants are assigned to different conditions; there is manipulation of one or more independent variables by the experimenter; there is a measurement of the effects of this manipulation on one or more dependent variables, and thereis control over all other variables. This study fits this description of an experimental design by comparing the effect of IA versus conventional instruction at the end of the three-week treatment period to determine whether it had a significant effect on the mean GAT scores of a gradeIX students.

3.4 Conceptual Framework

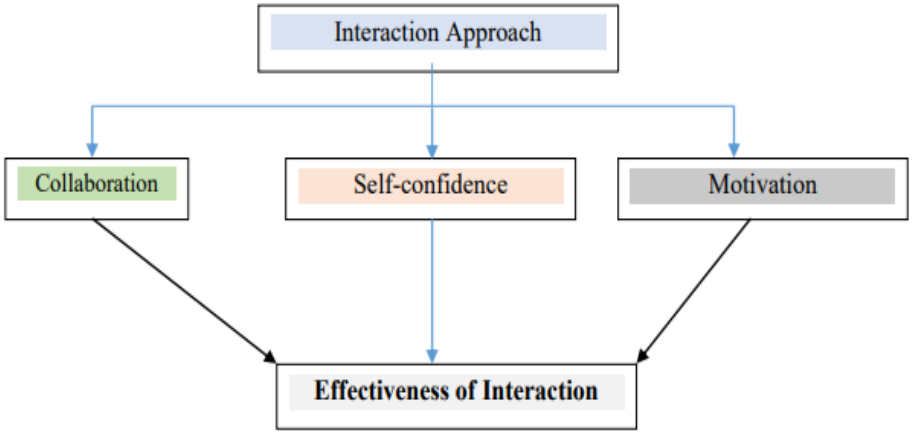


Figure 4.*Conceptual Framework in reference to Lev Vygotsky's theory of social development*

Figure 4 shows the conceptual framework that is based on Lev Vygotsky's theory of social development and aims to assess the effectiveness of IA in learning about rivers among grade IX students. The theory suggest that a significant portion of a child's crucial learning takes place when they interact with a competent teacher who can either demonstrate behaviors or provide verbal guidance to the child, which Vygotsky refers to as cooperative or collaborative dialogue.The study identifies different variables that contribute to the effectiveness of using IA in learning about rivers. By using IA, students actively support, assist, influence, motivate, trust, and challenge one another to effectively achieve the group's objectives.Further, this study centered on utilizing the IA to actively involve students in Geography learning. The chosen pedagogy was based on IA principles, with an emphasis on fostering self-confidence, collaboration, and motivation among students, which, in turn, resulted in improved student achievement in Geography, as measured by the GAT.

3.5 Population and Sampling of the study

3.5.1 Target population

A total of 68 Class IX students were selected for the study. The students were divided into two divisions namely A and B. These two sections were chosen for the study, which included 28 boys and 40 girls.

3.5.2 Sampling Technique

This study adopted purposive sampling as the area of study had a readily and easily available sample of two sections. One of the sections was considered as CG and the other as EG.

3.5.3 Sample size

In this study, purposive sampling was adopted for Class IX Geography at one of the middle secondary school under ThimphuThromdhe. According to Creswell [12], sampling is a process of selecting participants to make statistical inferences and estimate the characteristics of the whole population. Furthermore, as purposive sampling, Cohen et al. [11] support a group of different non-probability sampling techniques. Purposive sampling, also known as evaluative, selective, or subjective sampling, relies on the judgment of the researcher in selecting the participants for the study. Therefore, sample selection was made with a sample size of 68 students. The participants were drawn from two sections of the total of 68 students.

3.6 Research Instrument

The instruments used in this study were the Geography Achievement Test (GAT), a five-item Likert scale survey questionnaire of student perceptions of IA, and a structured interview. Data on geography performance was collected through the GAT, which consists of the pre-test and the post-test for each group. Similarly, data for students' perceptions of IA was collected through a survey questionnaire and a structured interview with the EG.

3.6.1 Geography Achievement Test (GAT)

The pre-test was conducted with CG and EG providing the students with the conceptual understanding of rivers prior to the intervention (lesson). The pre-test assisted in the baseline study of student performance in learning of rivers. It helped design an intervention for the students. The post-test performed for CG and EG was intended to find the effectiveness of IA as an intervention at the end of the experiment. The post-test instrument also helped assess student performance after the intervention.

3.6.2 Survey Questionnaire

The survey questionnaire was a research tool consisting of a series of statements to collect information from the students. It enabled exploration of the three themes of self-confidence, collaboration and motivation. It served as a second research tool to collect quantitative data. A total of 22 statements were

rated based on items on the 5-point Likert scale to assess students' perceptions of the effectiveness of IA. The questionnaires were handed out to the students in the (EG) after the post-test. The questionnaires assessed students' perceptions of the effectiveness of IA.

The survey questionnaire was adapted from the Harris [19]to examine students'perceptions of IA. The study adopted Brown Model criteria [8] to interpret the mean score of the students' perception level. The students, based on their experience gained with the help of IA, had to respond in the Google forms circulated in their Telegram. The five-point Likert scale was used to measure participants' level of perception (Table 1).

Table 1.*Measurement Scale of students' Perception*

Mean values	scores	Agreement	level of perception
4.10-5.00	5	Strongly agree	Highest
3.10-4.00	4	Agree	High
2.10-3.00	3	Neutral	moderate
1.10-2.00	2	Disagree	low
0.00-1.00	1	Strongly disagree	lowest

**Adapted from Brown (2010)*

3.6.3 Structured Interview

A structured interview was considered a typical form of interview in this study. One of the main advantages of a structured interview is the consistency of the information obtained, which ensures comparability of the data. The structured interview is usually designed to elicit specific answers from the respondents that correspond to the study objective. As most structured interviews are typically very specific, the possibility of variability is minimized, reducing error and making data processing and analysis easier. With the choice of this method, the study has focused thematically; therefore, respondents are highly focused on the main study goal [42]. This study included student respondents who were ranked into top two, middle two, and bottom two based on post-test performance of the EG. A total of 12 students from EG took part in the interview.

3.7 Validity and Reliability of Research Instrument

3.7.1 Validity

The three experts validated the data collection tools for pre-test and post-test questions. A senior lecturer from Samtse College of Education (SCE) and two senior M.Ed Geography students with more than five years of service experience validated the instrument. The questions were prepared following the competency-based question (CBT) format of the previous BCSEA questions (2020-2021). The experts evaluated the content, constructed and assessed the validity. It was therefore found that the items in the instrument were enough to obtain the expected data.

3.7.2 Reliability

According to Creswell [12], reliability is the consistency of the items of an instrument. The questions for the pre-test and post-test were piloted and ran Cronbach's Alpha to check its reliability. Additionally, reliability was determined using the Cronbach's alpha scale as shown in Table 2. The reliability scores were 0.88 and found to be highly reliableaccording to Andale [1].The survey questionnaire was adapted from the Harris [19] and tested with Cronbach's alpha 0.88, indicating the instrument was reliable for the study.

Table 2.*Description of Internal Consistency using Cronbach's Alpha*

Cronbach's Alpha	Internal Consistency
$\alpha \geq 0.9$	Excellent
$0.9 \geq \alpha \geq 0.8$	Good
$0.8 > \alpha \geq 0.7$	Acceptable
$0.7 > \alpha \geq 0.6$	Questionable
$0.6 > \alpha \geq 0.5$	Poor
$0.5 > \alpha$	Unacceptable

**Adapted from Andale (2014)*

3.8 Treatment

3.8.1 Experimental Group (EG)

The intervention for the EG was carried out for three weeks with three periods in one week of 40 minutes' duration. The introduction to the interaction took place at the beginning of the lesson. The individual consent of the students was obtained for participation in the EG. The students worked in teams of four to five members each. The discussion tasks, or IA, were assigned to each team according to the subject to be studied under rivers in each class, with each student following the team dynamics to complete the tasks. It was filled with student presentations and interactions between team members.

3.8.2 Control Group (CG)

In the CG, the topics taught were evenly distributed in terms of length. The intervention for this group involved using the lecture method or the conventional/teacher-centered approach. The topics were taught from the class IX textbook, and students had the opportunity to seek clarification by asking questions during the class. Additionally, students were assigned exercises as homework to reinforce their understanding of the topics taught.

3.9 Data Analysis

The explanatory sequential mixed-method design consisting of two phases was used [13]. First, the quantitative or numerical data was collected through the Geography Achievement Test (GAT) and survey questionnaires. The GAT was analyzed using independent sample t-test and paired sample t-tests. The survey questionnaire was analyzed using the Brown Model criteria to determine the degree of perceptions of the participants. Second, the qualitative data was collected through the structured interview and thematic analysis was done as per Creswell & Creswell [13].

3.9.1 Geography Achievement Test (GAT)

The Statistical Package for Social Sciences (SPSS) version 25 software was used for data analysis of descriptive and inferential statistics. Within a group, a paired-sample t-test was used to analyze the pre- and post-test in EG and CG. The pre-test and post-test results of the two groups were performed using the independent-sample t-test to assess and compare the students' learning performance after using the IA and conventional methods.

3.9.2 Survey questionnaire

A survey questionnaire was conducted to collect students' perceptions of IA. The data was analyzed using SPSS. Moreover, descriptive data analysis of mean and standard deviation was used to measure

students' perception levels. The Brown Model scale as shown in Table 2 was used to determine the scale or level of students' perceptions.

3.9.3 Structured interview

The data obtained from structured interviews were systematically processed through organization, transcription, coding, and categorization into different themes. Thematic analysis was conducted using the 6-step method developed by [13]. This approach allowed for a comprehensive examination of the qualitative data, enabling the identification and exploration of various themes that emerged from the interview responses.

Therefore, a structured interview was conducted to assess the reliability of responses to the GAT and the survey questionnaire. Ten students from the EG were chosen based on their GAT performance and interviewed to gather credible information. The interviews were recorded, transcribed, and color-coded according to themes of self-confidence, motivation, and cooperation. The students' responses were analyzed by manually coding and grouping them based on their post-test performance in the EG. Structured interview questions were used to gather insights on self-confidence, cooperation, motivation, and the advantages and challenges of using interactive approaches.

4. RESULT

This section introduces the analysis of quantitative and qualitative data. The results of the data are divided into four areas: the demographic information of the participants, the GAT, the survey questionnaire that analyzed students' perceptions, and structured interviews of the students from EG that analyzed the students' perception of the advantages and challenges of using IA.

4.1 Participants' Demographic Profile

The study involved 68 9th-grade students as participants, who were divided into two groups: the control group (CG) and the experimental group (EG). In the control group, there were 34 students, consisting of 14 boys and 20 girls, while the experimental group comprised 34 students, with 14 boys and 20 girls.

4.2 Geography Achievement Test (GAT)

In order to compare the learning outcomes of the students, pre-tests and post-tests were carried out before and after the intervention. The pretest should test the ability and background knowledge of the participants for the CG and EG. Similarly, the post-test was conducted to find the differences in learning performance after the intervention or treatment. An independent t-test was performed for CG and EG at the significant level of 0.05. To find the statistically significant differences within the groups, a paired-sample t-test was performed for comparative analysis between the groups.

4.2.1 Pre-test Analysis (Independent sample t-test)

An independent sample t-test with a 95% confidence interval was performed before treatment to compare pre- and post-test results between CG and EG. This was done to assess uniformity of skills prior to the intervention. The result thus generated between the groups is given in (Table 3).

Table 3.*Analysis on Independent Sample T-test for Pre-test between CG and EG*

GAT	CG		EG		*t*(33)	*p*	Cohen's d
	M	SD	M	SD			
Pretest	8.21	1.53	8.71	1.24	-1.155	.145	0.35
Post-test	10.50	1.59	15.29	1.23	-8.569	.000	3.37

***** *Cohen's d "rule of thumb" small effect=0.2, Medium Effect=0.5, Large Effect = 0.8*

An independent sample t-test at a 95% confidence interval was conducted to determine if there was the difference between CG and EG on the effectiveness of IA in learning Geography. Students in CG (N = 34) scored, on average, (M =8.21, SD = 1.53) in the pretest, while students in EG (N = 34) scored, on average (M = 8.71, SD = 1.24) in the pretest. This difference between CG and EG was not statistically significant, $t(33) = -1.16$, $p = .15$, Cohen's d = 0.35. Thus, the test failed to reject the null hypothesis. The effect size was calculated using Eta squared and it was found 0.35 which translates to low magnitude according to Cohen 1992.

On the other hand, students in CG scored an average of (M = 10.50, SD = 1.59), while EG scored an average of (M = 15.29, SD = 1.23). There was a statistically significant difference in the post-test, $t(33) = -8.57$, p = .00, Cohen's d = 3.37. Hence, the null hypothesis is rejected. The observed effect size of 3.37 indicates a large level of magnitude.

4.3.2Comparison of Pre-Test and Post Test scores within Group (Paired Sample T-test)

Table 4.Analysis on Paired Sample T-test for Pretest and Post-test Scores of CG and EG

GLAT	CG		EG		$t(33)$	p	Cohen's d
	M	SD	M	SD			
Pretest	8.21	1.53	8.71	1.24	5.39	.00	1.05
Post-test	10.50	2.67	15.29	2.05	22.50	.00	3.88

***** *Cohen's d "rule of thumb" Small effect = 0.2, Medium Effect = 0.5, Large Effect=0.8*

The paired sample t-test at a 95% confidence interval was conducted to compare the pretest and post-test within the groups to determine if students in CG (N = 34) and EG (N = 34) in Geography class improved or declined from pretest to post-test. The test for CG revealed that students statistically improved in their test performance from the pretest (M = 8.21, SD = 1.53) to the post-test (M = 10.50, SD = 2.67), $t(33) = 5.39$, p = .00, Cohen's d = 1.05.

Similarly, the test for EG has shown that students statistically enhance their test performance from the pretest (M = 8.71, SD = 1.24) to the post-test (M = 15.29, SD = 2.05), $t(33) = 22.50$, p<.001, Cohen's d = 3.88.

4.4 Survey Questionnaire Analysis on Perceptions of the Students towards IA

The survey questionnaire used in this study comprised 22 statements, categorized into three themes: self-confidence, motivation, and cooperation. It was administered to the EG consisting of 34 students, and responses were collected on a 5-point Likert scale. The Brown model was employed to interpret the mean scores. The quantitative data analysis revealed that students held generally positive perceptions about the IA. More specifically, a descriptive analysis using means and standard deviations was conducted to assess the impact of IA. The topics of self-confidence, motivation, and collaboration served as independent variables, while their effects on GAT (dependent variable) were analyzed.

4.4.1 Students' Self-confidence

Table 5.*Students' rating on self-confidence with IA*

No.	Item	Mean	SD	Level of Perception
1.	It was my responsibility to learn what I need to know from rivers through the IA.	4.12	.91	Highest

2.	I was afraid to make mistakes in interaction class.	3.26	.99	High
3.	I was confident to learn the three-fold work of rivers through the IA.	4.06	.92	High
4.	I could learn about the hydrological cycle that derives water for rivers through IA.	4.24	.65	Highest
5.	I was able to learn about the process of transportation by rivers from the IA.	4.15	.66	Highest
6.	I knew how to use the IA to learn critical aspects of the sources of rivers.	3.85	.82	High
7.	I am confident that I had mastered the topic of denudation work of rivers through IA	3.71	.72	High
	Overall average	**3.91**	**.81**	**High**

Level of opinion:0.0-1 Lowest, 1.1-2 Low, 2.1-3 Moderate, 3.1-4 High, 4.1-5 Highest: Brown (2010)

Table 5 presents a descriptive analysis of student confidence with the overall average mean (*M* = 3.91, *SD* = .81), based on ratings from 7 items, indicated that the majority of respondents strongly agree that they have high level ofpositive perception towards us IA in learning of rivers in Geography.

Moreover.the qualitative findings further reinforce this positive perception, as the interview participants expressed favourable views that the use of IA in learning has increased the students' *self-confidence.* For instance, participants S1, S2, S3, S4, S7, and S9 articulated that the IA facilitated sharing their thoughts and understanding. Similarly, the participants also mentioned that IA fostered trust, interaction, and encouraged open discussions, which improved their learning experience in studying rivers. S8 expressed, "IA had a positive impact on their confidence to share their understanding with friends and to question their own comprehension, leading to enhanced learning and confidence." Additionally, S10 shared that IA increased their confidence in asking questions to the teacher. These responses strongly support the idea that the use of IA has a significant and positive impact on student learning experiences.

4.4.2 The students' motivation

Table 6*Rating on student's motivation in the learning of rivers using IA*

No.	Item	Mean	SD	Level of Perception
1.	The interaction approach made my classroom learning easier through collaboration.	4.29	.63	Highest
2.	Team members supported the articulation of the answers to questions on the types of erosion caused by rivers.	4.21	.69	Highest
3.	The classroom learning on depositional work of rivers became more collaborative with an IA .	4.29	.58	Highest
4.	I could participate more than usual in the IA .	3.85	.78	High
5.	I could understand when my classmate explained on transportation work of rivers.	4.06	.78	Highest
6.	The interaction approach helped to boost collaborative learning with classmates.	4.29	.68	Highest
7.	The interaction approach helped me learn along with classmates.	4.29	.52	Highest
	overall average	**4.18**	**.67**	**Highest**

Level of opinion:0.0-1 Lowest, 1.1-2 Low, 2.1-3 Moderate, 3.1-4 High, 4.1-5 Highest: Brown (2010)

Table 6 shows the level of perception of student motivation in using IA on learning rivers. As the overall mean (*M* = 4.18, *SD* = 0.67) indicated that respondents have the highest level of opinion on learning rivers using of IA. This represented a positive correlation within the group.

The qualitative results also revealed that students have a positive perception toward the use of IA in learning of rivers in Geography as it enhanced the students' motivation *in the learning of rivers using IA*. For instance, all the participants emphasized that the use of IA facilitated sharing doubts, correcting mistakes, improving grammar and speaking skills, and reaching a consensus, which enhanced bonding and made learning about flows easier. S8 mentioned, "IA positively influenced collaborative study among friends, with group members actively listening to and correcting each other's opinions." S9 highlighted how IA improved collaboration and relationship building within teams, allowing for mutual questioning and doubt clarification. S10 noted that working with IA encouraged new learning and allowed for asking questions and gaining better understanding through interactions with friends. Thus, the impact of IA on collaboration improves communication between students and teachers, fosters open sharing of ideas and honest feedback, and creates a psychologically secure and comfortable learning environment.

4.4.3 The students' collaboration

Table 7 *Rating on students' collaboration of IA in learning rivers*

No.	Items	Mean	SD	Level of perception
1.	I liked the interaction approach in learning.	4.32	.59	Highest
2.	I enjoyed learning in an interactive discussion with classmates.	4.26	4.12	Highest
3.	I was motivated to exchange views with classmates.	4.12	.59	Highest
4.	I was motivated to learn the denudation work of rivers through the interaction approach.	4.12	.54	Highest
5.	The use of the interaction approach motivated me to learn the types of erosion caused by riversas well.	4.15	.66	Highest
6.	I felt comfortable interacting with classmates through an interactive approach.	4.29	.72	Highest
7.	I was excited when I learned through the IA.	4.35	.49	Highest
8.	The way I learned through the interaction approach was suitable for me to learn on denudation work of river.	4.21	.73	Highest
	Overall average	**4.23**	**0.62**	**Highest**

Level of perception:0.0-1 Lowest, 1.1-2 Low, 2.1-3 Moderate, 3.1-4 High, 4.1-5 Highest: Brown (2010)

Table 7 reveals the average mean of score (*M* = 4.23, *SD* = 0.62) is rated the highest as the respondents indicated that there is increased collaboration to learn rivers using IA.

The qualitative results also indicated that students have a positive perception that the use of IA increased the students' collaboration in learning of rivers. For instance, S1 expressed that using IA made it easier to acquire new knowledge through interactive learning. S2 highlighted the benefits of teamwork in correcting mistakes and motivating students. They found motivation when other students in the team shared new information with teachers. S4 mentioned, "IA positively influenced their motivation to learn, particularly when friends provided new information, making them feel more comfortable in sharing their opinions." S6 emphasized that IA promoted motivation and knowledge acquisition, as students were encouraged to share interesting and fun things with their friends, leading to increased engagement and learning. Further, S8 supported this idea, stating, "IA allowed students to learn from each other and stay motivated, making learning more enjoyable through interactions with friends rather than solely relying on the teacher's

support." S7 and S9 also shared how IA increased their motivation as they better understood explanations from their peers compared to strict teacher explanations, leading to a positive impact on their motivation to learn.

4.5.1 Students' perception of the advantages of using IA

The interview participants articulated that incorporating IA into their learning process about rivers proved to be highly effective in grasping the geographical locations of rivers. IA also stimulated their curiosity, providing satisfactory answers to their inquiries. The participants expressed contentment with the collaborative and team-based learning experience facilitated by IA, as it allowed them to interact and learn together. S5 said, "IA approach helped them gain a deeper understanding of river sources and their significance in real-life scenarios. Working in teams provided opportunities to learn more and exchange knowledge among peers." Similarly, S9 and S2 appreciated how IA made the learning process more engaging and effective. They highlighted the benefits of learning about river sources, sediment deposition, and transport mechanisms, as well as gaining a better understanding of rivers by comparing them with other geographical features. Additionally, the students emphasized the value of teamwork and effective communication while presenting information about rivers, fostering a sense of sharing knowledge with their classmates.

4.5.5 Students' perception of the challenges of IA

Some of these challenges were not adequately considered from the students' perspective, and it might have been more appropriate for teachers to intervene. Some participants found it difficult to approach the teacher for assistance, and a few lacked motivations to complete the assigned activities. Additionally, some participants reported that their peers were off-topic and had difficulty getting along with each other during the learning process. Furthermore, some students struggled to comprehend the material, and there were disagreements among them about the points discussed.

Moreover, participants expressed difficulty in articulating their thoughts effectively, and they faced distractions that affected their concentration. Finally, there was a lack of seriousness in approaching the interactive activities. For instance, S8 mentioned,"the challenges they faced while learning about rivers using the IA were related to their peers' behavior. Some group members were not actively participating, and others deviated from the assigned topic." Additionally, S6 pointed out that the challenges they encountered with IA were their friends being distracted and not engaging in the learning process as expected. Similarly, S4 shared, "some of team mates were not focused and disagreed with their ideas during the learning sessions."

5. DISCUSSION

Discussions are presented related to IA improving student performance outcomes in Geography, and how IA improves student perceptions of Geography as measured by self-confidence, motivation, and collaboration.

5.1 Effectiveness of IA on Learning of Rivers in Geography

The findings revealed that there was no statistically significant difference in the average scores of the students in the CG and EG during the pre-test conducted before the treatment. However, there was a statistically significant difference in the average scores during the post-test for both groups. Specifically, the post-test average score of the EG was significantly higher than that of the CG. These results suggest that the students in the EG performed better than those in the CG. Thus, it can be inferred that IA was found effective in learning of river and improved the students' performance.

The independent sample t-test initially showed no significant difference in learning abilities between the EG and CG before treatment. Both groups had consistent pre-test scores. However, after the intervention, the EG performed significantly better than the CG in Geography, with a high Cohen's d effect size of 3.35. This result aligns with previous research by Liu [37], which also found significantly higher post-test scores in the EG compared to the CG in learning with IA.

The results from a paired-sample t-test showed a statistically significant improvement in learning achievements for both groups. However, the EG, which learned through an IA, demonstrated a significantly greater improvement (P<.001) compared to the CG, which learned through a conventional approach (P< .05). This finding is consistent with previous studies that also reported the effectiveness of interactive approaches in enhancing student performance [53].Likewise, a study conducted by Syaefulloh and Sumunar[49] found that an average of 36 students in a secondary school increased performance outcomes treated with an interactive approach higher than the class treated with the conventional method. Another study by Huang et al. [21] showed that interactions between peers and between teachers and students were effectively increased. Consequently, the size of the mean difference was further analyzed using Cohen's d effect size for both groups. The magnitude of the mean difference was larger in EG than CG, indicating that there was a larger effect on student performance in geography in EG than in CG. Overall, the interactive approach proved to be more effective in helping students understand rivers compared to the conventional approach.

5.2 Survey Questionnaire Analysis on Perceptions of the Students towards IA

5.2.1 Students' Self-confidence

The overall average mean (M = 3.91, SD = .81), based on ratings from 7 items, indicated that the majority of respondents strongly agree that they have positive perception towards IA in learning of rivers in Geography. Moreover.the qualitative findings further supported the quantitative findings, as students showed favourable views towards the use of IA in learning Geography as the students enhanced their confidence while using IA in learning.

IA is a learner-centred system and the teacher and the learner swap their traditional roles, which allows the learner to actively participate in the learning process [16]. The study is also consistent to the findings of Lauster[33], who found that self-confidence is an attitude or sense of confidence in one's abilities so that the sufferer is not overly fearful in their actions, feels free to do what they want and is accountable for their actions, is warm-hearted and polite in dealing with people. The participants agreed in this study too. Similarly, Rubio [45] stated that low self-confidence can lead to some psychological conditions such as feelings of insecurity, fear, anxiety and antisocial behavior. This can also be the case in geography lessons. A person who lacks self-confidence will most likely have a negative bias towards the course and the classroom. Moreover, Hayrettin [18] found that students are unable to socialize properly and refrain from speaking in the classroom. In contrast, this was not the case in this study, as most students were self-aware and had a positive perception toward the use of IA. The teacher is the hallmark of the classroom by creating an environment in which each student feels self-confident. Further, Hayrettin [18] concluded that creating classroom environments where students feel comfortable answering questions and expressing themselves without fear of failure promotes their confidence. Encouraging active participation, offering immediate positive feedback, and providing enjoyable activities further contribute to building their self-confidence.

Furthermore, Karimi and Saadatmand[29] conducted a study to investigate the association between self-confidence and academic performance based on academic motivation. Their study revealeda positive correlation between academic achievement, self-confidence, and educational motivation, indicating that confident students tend to perform better academically. Therefore, positive feedback, positive motivation, and school-based solutions to student problems boost students' self-confidence.

5.2.2 The students' motivation

The overall mean (M = 4.18, SD = 0.67) indicated that respondents have the highest level of opinion on learning rivers using of IA. The qualitative results also revealed that students have a positive perception toward the use of IA in learning of rivers in Geography as it enhanced the students' motivation in the learning using IA.

This finding is in line with the findings of Isik et al. [23], who found that students are motivated by the effectiveness of the teacher, friends, the individual's attitude towards the school, students' perceptions of

their abilities, past experiences (positive or negative), the importance attached to student success is attached to the parents' approach to their children and school. Additionally,Aydin and Coskun[4] found that highly motivated students will enjoy doing challenging exercises and answering difficult questions. On the other hand, low-motivated students are needed to ensure success knowledge and increase motivation by moderating the difficulty level of the questions. This makes motivation a key factor in learning the Geography lessons.

However, this study found that IA's intervention on student motivation was highest. This is consistent with the study by Yangzom[53], in which students responded that feedback from friends and teachers motivated learners to contribute more to their team's success. Further, the link between learning and motivation is also suggested by Afzal et al. [2] who stated that motivation has positive effects on student learning. This study also confirms that the students with the highest mean in the cognition level were motivated, indicating that the students were motivated by using IA as an intervention.

5.2.3 The students' collaboration

The overall average mean(M = 4.23, SD = 0.62) is rated the highest as the respondents indicated that there is increased collaboration to learn rivers using IA. Similarly, the qualitative results also indicated that students have a positive perception that the use of IA increased the students' collaboration in learning of rivers in Geography.

Collaboration offers numerous benefits on a personal level, including increased moral support, and is crucial for supporting learning and the learning process itself [17,20].As suggested by Crouch and Mazur [14], through collaboration, individuals can transcend mere functional aspects of coordination and communication to embrace collective aspects, benefiting from diverse knowledge, experiences, and perspectives within a team.The finding is in consistent with Al-Zahrani[3] who highlighted the importance of student interactions in collaborative groups, fostering critical thinking, improved communication skills, and hands-on experiences. Moreover, students agreed that collaboration significantly enhanced their learning experiences. Ultimately, collaboration plays a significant role in enriching students' educational experiences and achievements.

Additionally, Al-Zahrani[3] conducted a study highlighting the benefits of student interactions within collaborative groups, which promote critical thinking, communication skills, and hands-on experience. By engaging in classroom discussions and problem-solving activities, students gain exposure to diverse viewpoints and approaches, leading to a broader range of potential solutions for assignments. Collaborative learning fosters knowledge exchange, enhances retention, and boosts intrinsic motivation to learn. It also improves communication skills, including active listening, and encourages the development of healthy social relationships. In the context of individual IA, collaboration teaches the importance of teamwork and can further enhance critical thinking and analytical abilities.

5.3 Students' Perception of the Advantages of using IA

The core finding of the study is that incorporating IA into the learning process about rivers proved highly effective in enhancing students' understanding about riversin Geography, stimulating their curiosity, and fostering collaborative learning experiences.

Giorgdze and Dgebuadze[16] asserted that IA fosters a learning process where all students actively participate in the cognitive aspects, contributing to teaching and exchanging information and ideas. This approach not only facilitates knowledge acquisition but also cultivates important communicative skills such as active listening, evaluating different perspectives, engaging in discussions, making collective decisions, and developing tolerance. Similarly, Kagoda[28] also supported this notion by highlighting how IA promotes group discussions, helping students become aware of their inhibitions, defenses, and assumptions. Through such awareness, students can better understand their peers' challenges and provide support to overcome them.

5.4 Students' Perception of the Challenges of IA

IA in education offer benefits but are also accompanied by challenges, including difficulties in approaching teachers, laziness in completing tasks, distractions, disagreements among peers, and struggles with comprehension. Furthermore, a lack of seriousness and focus during interactive activities, along with some students being off-topic and unengaged, contribute to the challenges faced in implementing IA in the learning process.

The challenges teachers and students face in using IA is in consistent with Sanduri[47] who emphasize that having more students in a class is the challenge that hinders the effective use of interaction. Similarly, a study conducted in Ghana, by Ayeni and Olowe[5] revealed that the students' lack of organization and ineffective participation in classroom activities were attributed to overcrowded classrooms, which exceeded their capacity in most schools. This situation negatively impacts the successful implementation of learner-centered approaches, as it requires close teacher supervision, an issue also observed in Bhutanese classrooms with high student numbers and a low teacher-student ratio of 1:25 [46].Overall, implementing interactive approaches in education came with challenges such as maintaining focus and cooperation within student groups, which impacted the effectiveness of the learning experience.

5. CONCLUSION

This study aimed to assess the effectiveness of using IA as an approach in learning of rivers in ninth-grade. The findings of this study indicated that students who were taught using IA performed better compared to those taught using conventional approaches. There was a significant statistical distinction in the GAT scores between the two groups (CG and EG) in the post-test. Specifically, the CG showed a significance level of score (P = .05), while the EG exhibited an even greater significance level with a score of (P< .001).

The descriptive analysis of the EG revealed that IA positively impacted student performance in Geography and proved to be a suitable learning method for the subject.Besides, students reported enjoying learning with IA, expressing enthusiasm for the collaborative and proactive nature of the tasks within teams. Hence, the learners displayed increased cooperation, motivation, and self-confidence, while the teacher's role shifted to that of an organizer, fostering stronger relationships with the students. This learner-centered and activity-based approach encouraged active participation. The students in the IA group also expressed positive perceptions of this approach during structured interviews and surveys. Further, the findings of the studysuggested that teachers should consider using IA to engage students in learning and promote collaboration, motivation, and self-confidence.

Overall, this research emphasizes the effectiveness of the IA in teaching and learning of rivers to ninth-grade students. It highlights the advantages of IA over traditional methods, showcasing enhanced performance, heightened engagement, and positive student perceptions. The study advocates for the adoption of IA by educators to create a dynamic and participatory learning environment, fostering cooperative interactions, motivation, and self-confidence among students. Ultimately, the incorporation of IA stands as a promising avenue for reshaping and enhancing pedagogical approaches in Geography and potentially other subjects.

Consent

As per international standard or university standard, Participants' written consent has been collected and preserved by the author(s).

6. RECOMMENDATIONS

The study suggests that future research should replicate similar interventions across various grade levels, employing larger participant groups and extending the study duration for more robust and significant

findings. While this study focused on applying IA within cooperative learning approaches, future research can explore its effectiveness across diverse subjects and subject matters. Ultimately, fostering active student participation and collaborative involvement among students holds paramount importance in the modern educational landscape, aiming to amplify students' competitive edge.

7. Significance of the Study

The study delves into an innovative teaching approach, the IA, which could pave the way for enhancing pedagogical methodologies. Its findings could offer educators in Bhutan and beyond new strategies to engage and motivate students, potentially leading to improved learning outcomes.

By rigorously evaluating the effectiveness of IA, this study contributes empirical evidence to the discourse on modern teaching techniques. It provides concrete data that educators, policymakers, and researchers can reference when considering the adoption of IA in their classrooms.

This study was conducted in a Middle Secondary School in Western Bhutan, the study acknowledges the importance of context in education. Its findings could provide insights into the suitability of IA within the Bhutanese educational framework and contribute to discussions on contextualized educational reforms.

The study's focus on the IA emphasizes student-centered learning, a pedagogical philosophy gaining prominence in contemporary education. By prioritizing student engagement, collaboration, and active participation, the study aligns with the goals of fostering well-rounded and motivated learners.

Bhutan's education system is continually evolving to meet the demands of the 21st century. This study's findings could inform educational policies and strategies in Bhutan by introducing effective and innovative teaching practices that align with the country's developmental aspirations.

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