

Small-scale Inter-school Science Fair in the Ningo-Prampram District of Ghana: Inspiring Students through Scientific Inquiry

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Abstract This paper describes the preparation and implementation of an inter-school science fair in the Ningo-Prampram District of Ghana and analyzes its impact using both quantitative and qualitative methods. The fair aimed to foster scientific inquiry through hands-on, project-based learning. Twenty junior high schools (JHSs) were invited, and 22 students from 11 schools (9 public, 2 private) participated. Data were collected through surveys, project evaluations, and observations. Results indicate the fair stimulated students' interest in STEM, enhanced their scientific understanding, and developed teamwork, problem-solving, and communication skills. Although average scores were similar between male-male (44.3) and male-female teams (44.2), highly motivated teams achieved higher scores ($r=+0.66$), while preparation time showed a weak correlation with performance ($r=+0.12$). Teachers emphasized creativity (58%) as the main criterion for student selection, followed by interest (17%) and scientific understanding (17%). The study concludes that with teacher guidance and a focus on applying science concepts in project design and presentation, small-scale science fairs can be a practical and impactful tool for improving science education in resource-limited settings.

Keywords: science education in Ghana, STEM education, JHS, small-scale inter-school science fair, budget friendly science activities, scientific inquiry, Ningo-Prampram District

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1. Introduction

Scientific inquiry is regarded as an important curricular goal globally [1]. Empirical evidence indicates a correlation between the widespread use of inquiry-based science instruction in developed nations and the continued reliance on traditional teaching methods in many African schools. This disparity constitutes a significant factor contributing to low scientific literacy across Africa [2].

Scientific inquiry refers to the diverse ways in which scientists study the natural world and propose explanations based on the evidence derived from their work. Inquiry also refers to the activities of students in which they develop knowledge and understanding of scientific ideas, as well as an understanding of how scientists study the natural world (National Research Council 2000, p. 21) [3].

Scientific inquiry is an iterative process, often involving repeated steps as new questions arise and new evidence is gathered. It is a fundamental method for advancing knowledge and understanding in science.

Despite the Ministry of Education in Ghana

emphasizing learner-centered approaches, including experiential, problem-based, project-based, and talk-for-learning strategies [4], there is limited evidence of inquiry-based science instruction being implemented in Ghanaian Junior High Schools (JHSs) [2].

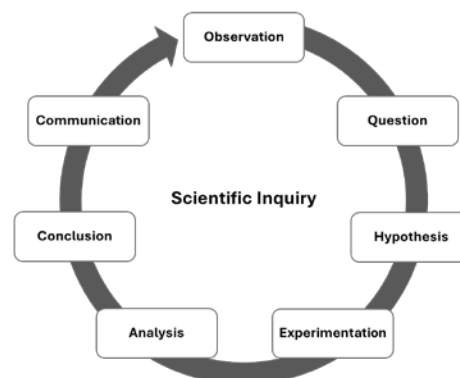


Figure 1. Key steps of scientific inquiry

Traditional science teaching often involves learners passively listening to teachers lecture on scientific content, structure, and results, or simply transcribing notes for memorization [5,6]. Such practices have been examined

for being ineffective, as they can inhibit spontaneity, initiative, creativity, and critical thinking skills [7].

Hands-on education, on the other hand, is a learner-centered approach [8]. The inherent motion and interactivity with materials [9] encourage students to make discoveries through observation [10], solve problems, formulate their own questions, and seek answers [7]. This approach fosters the development of students' problem-solving skills, creativity skills, and independent learning skills [10]. By engaging with real-life examples and observing how changes in variables affect outcomes [8], students gain a deeper understanding of scientific concepts, rather than simply memorizing facts [10]. Students become more motivated and engaged in lessons [11]. They take greater responsibility for their own learning, achieving successful outcomes by connecting prior knowledge with new information. This allows them to construct and express their understanding more effectively [12]. Learner-centered education incorporates a variety of active learning strategies, such as panel discussions, quizzes, projects, brainstorming, role-playing, debates, field trips, and discovery learning. These approaches emphasize active student engagement, where learners solve problems, formulate their own questions, and seek answers.

The prevalent 'lecture' approach in Ghanaian science education tends to be teacher-centered, emphasizing knowledge transfer through explanations, notes, and some question-and-answer techniques [13,14,15]. The main reasons for the lack of practical learning in Ghanaian classrooms are inadequate science labs, limited resources, and insufficient teaching and learning materials [13].

This finding was further validated by a survey conducted across 46 schools (23 public and 23 private), involving 48 science teachers and 899 students in the Ningo-Prampram District of Ghana. The survey revealed that only 10% of students reported having access to a dedicated science lab at their school. Moreover, 81% of science teachers cited a lack of facilities, while 13% pointed to a lack of materials as key challenges hindering effective science instruction [16].

Interview responses from some teachers and educational administrators reveal that inquiry-based science instruction is rarely implemented in JHS in Ghana. Teachers mentioned that hands-on activities were not conducted due to a lack of basic instruments. Additionally, interviewees mentioned that the STMIE (a program for JHS students to use local and other materials to make products and models for exhibition at science clinics or fairs) was "rarely implemented" and "has not been functional" [2].

Science fair projects can enable students to enjoy the autonomy of conducting inquiry projects and other benefits associated with student-initiated inquiry. By doing a science fair project, students have the opportunity to investigate a phenomenon that interests them [1].

An important positive outcome of the science fair would be for students to become more interested in science [17]. Studies have shown that participation in science fairs enhances students' understanding of science

content and inquiry while positively influencing their attitudes toward STEM courses and careers, with a strong emphasis on science inquiry as a key strength [1,18].

Schmidt et al. studied students' attitudes toward their STEM subjects and careers by surveying students who had participated in a science fair [18]. While some students had a positive attitude, others mentioned that science was stressful and difficult, which seemed to be due to the length and complexity of the project.

This paper builds upon the proposed solution for small-scale science fairs introduced in the previous study. It extends earlier findings by analyzing the outcomes of the inter-school science fair organized in the Ningo-Prampram District, Ghana, where twenty schools (10 public and 10 private) were invited [16]. A survey, utilizing two tailored questionnaires—one for teachers and one for students—was administered after the event to assess its impact.

2. Methods

This section outlines the organization and execution of the first inter-school science fair held in collaboration with the Ghana Education Service (GES) within the Ningo-Prampram District of Ghana.

2.1. The First Science Fair was Organized

Since this inter-school science fair was the inaugural event of its kind in the region, 20 schools were selected for participation instead of an open competition. Ten public schools and ten private schools were chosen by the Ningo-Prampram District Office of the GES, taking into account their proximity to the host school. Official invitations were distributed by the District Director.

To share more information about the science fair, headteachers and science teachers were invited to a newly created *WhatsApp* group two months prior to the event. The rules and guidelines, along with an example of the entire preparation process, were shared in the group. In consultation with the Ghana Education Service (GES), it was announced that the Science Fair would be held on September 20, 2024, during the first week of the academic year. This timing was chosen to give active students enough time to prepare their projects for the fair over the break. The date and requirements were communicated through the *WhatsApp* channel.

Teachers were encouraged to select two team members without bias towards boys and girls. Students were given the freedom to explore any topic that interested them and were encouraged to use readily available materials for their projects. To promote creativity, commercially made products were prohibited. Teachers were expected to guide participating students as mentors.

A Google Form was created for online registration. Teachers were to fill in the School Name, Project Title, Name of the teacher in charge, names of students, and grade. The scoring criteria were adapted from the previous intra-school science fair [16], except for the 'working model' criterion, which was replaced with 'demonstration' to emphasize active student presentations.

Each criterion is formulated to promote the scientific

inquiry steps, such that ‘creativity’ corresponds to the observation and question steps, ‘design’ corresponds to the hypothesis and experiment steps, ‘demonstration’ corresponds to the analysis and conclusion steps, and ‘presentation’ corresponds to the communication step as in Table 1. This information was included in a flyer and posted on the platform.



Figure 2. A flyer for the Inter-school science fair

Table 1. Scoring criteria and points

Creativity	Design	Demonstration	Presentation
Observation Question	Hypothesis Experiment	Analysis Conclusion	Communication
5 points (25%)	5 points (25%)	5 points (25%)	5 points (25%)

While students are preparing for the science fair, they will naturally engage in scientific inquiry. They will actively involve themselves in critical thinking and problem-solving. These skills are often not as actively developed in traditional lecture-based teaching. The students' active and confident demeanor during their project presentations provided strong evidence that their scientific inquiry was engaged.

In this regard, teachers can play a crucial role in guiding students to identify and solve problems on their own by understanding the scientific inquiry process and observing students' activities. They can achieve this by posing appropriate *what*, *how*, and *why* questions.

In the meantime, the author wrote a science hands-on activity book titled "Science for Anyone" based on the author's experience with science activities, to be distributed to the participants. The author also created and

circulated a fundraising video with the goal of raising USD 1500 to support the science fair.

2.2. The First Science Fair was Held

Invited schools were asked to register their project titles and student names using an online form. Despite several deadline extensions, 10 public and 5 private schools registered. Ultimately, on the day of the science fair, nine public and two private schools participated with their entries. Each team set up its project boards and displayed their work on assigned tables.

Following the opening ceremony, three judges visited each table, allowing students 3-5 minutes to present their project boards and demonstrate their work. This was followed by a Q&A session, after which the projects were scored based on four predetermined criteria: creativity, design, demonstration, and presentation, with each criterion worth 5 points.

2.3. Survey on the Inter-school Science Fair

While the science projects were being judged and scores were being tabulated, teachers and students were surveyed about the science fair using separate questionnaires. Both groups were asked about their experiences during project preparation and their participation in the fair. Furthermore, they were asked to rate their satisfaction with the fair and express their willingness to participate in future inter-school science fairs.

Survey Questions for the Science Teachers

Science teachers were surveyed using a questionnaire comprising nineteen questions categorized into three areas: (1) participant selection, (2) project preparation and support, and (3) impacts and future participation.

1. Could you select the student participants easily? [Difficult, Moderate, Easy, Very easy]
2. Did you consider the gender of the students when selecting the participants? [Yes, No, Maybe]
3. Do you think male students are more interested in learning science than female students? [Yes, No, Maybe]
4. How is your school team composed? [Males only, Male and Female, Females only]
5. What did you consider the most when selecting participants from among your students? [Interest and enthusiasm, Creativity and innovation, Scientific understanding, Teamwork and collaboration, Presentation skills]
6. How many hours do you think your students have spent completing the project? [3 hours, 5 hours, 10 hours, 10+ hours]
7. Do you think your students could get the required materials and resources easily? [Difficult, Moderate, Easy, Very easy]
8. Do you think your students kept motivated and engaged throughout the entire process? [Poor, Fair, Good, Very much]
9. Do you think your students collaborated well? [Poor, Fair, Good, Very well]
10. How effective do you think students were in carrying out the project with relevant science concepts? [Not at all, Slightly, Moderately,

- Significantly]
11. Do you think your school was supportive? [Poor, Fair, Good, Very much]
 12. Do you think this science fair has offered students an opportunity to develop **critical thinking**? [Poor, Fair, Good, Very much]
 13. Do you think this science fair has offered students **problem-solving skills**? [Poor, Fair, Good, Very much]
 14. Do you think this science fair has offered students a deeper **understanding of scientific concepts**? [Poor, Fair, Good, Very much]
 15. How much do you think your students have increased their **interest in science** while preparing for this science fair? [Poor, Fair, Good, Very much]
 16. Based on your experience at this science fair, how likely are you to try **hands-on activities** in your science class? [Not likely, Slightly likely, Moderately likely, Very likely]
 17. What do you think are the biggest realistic barriers to hosting an intra-school science fair? [Not likely, Slightly likely, Moderately likely, Very likely]
 18. Based on your experience at this science fair, are you interested in organizing an **intra-school science fair** at your school? [Lack of teachers' interest, Lack of students' interest, Inadequate funding, Insufficient infrastructure]
 19. If there were an **inter-school science fair** like this one, would you recommend your students to participate in it? [Not likely, Slightly likely, Moderately likely, Very likely]

Survey Questions for the Students

Students were also surveyed using a questionnaire comprising nine questions in three categories: (1) STEM interest and learning experience, (2) skill development, and (3) challenges and future participation.

1. Do you plan to study Science, Technology, Engineering, and Mathematics (STEM) as your career? [Yes, No, Maybe]
2. How well did the science fair help you **understand science concepts**? [None, Fair, Good, Very much]
3. Do you think the event helped you practice and improve your **teamwork skills**? [Poor, Fair, Good, Very much]
4. Has this event helped improve your communication/public speaking skills? [Poor, Fair, Good, Very much]
5. Were you able to get the help and support you needed from your parents for your project? [Poor, Fair, Good, Very much]
6. Were you able to get the help and support you needed from your teacher for your project? [Poor, Fair, Good, Very much]
7. What challenge have you faced in preparing for or during the science fair? [Coming up ideas for a science fair entry, Getting necessary materials, Turning ideas into project work and making a project board, Public speaking and presentation]
8. What was your favorite part about participating in the science fair? [Acquired scientific concepts, Practiced teamwork skills, Turned an idea into a project work, Practiced public speaking with my presentation]

9. If there is another Science Fair in your school district, will you participate? [Not likely, Slightly likely, Moderately likely, Very likely]

3. Results

This section presents the results of the first inter-school science fair held in the Ningo-Prampram District. The Ghana Education Service (GES) selected a total of 20 schools, considering their proximity to the host school, with 10 public and 10 private schools. Eleven schools participated: 9 public and 2 private. Survey results from 11 participating teachers and 22 participating students from 11 schools (9 public, 2 private) are analyzed and discussed, along with a discussion on the potential of small-scale inter-school science fairs.

Public schools: GES security regulations prohibit teachers from meeting privately with students outside school hours without official permission. This hindered their ability to work with students during school breaks to prepare for the science fair. Nonetheless, nine out of ten invited public schools participated.

Private schools: In contrast, private schools are permitted to conduct extra classes with parental consent, potentially providing them with an advantage in project preparation. The author was surprised that only 2 out of the 10 invited private schools participated, despite the generally high academic standards and resources available in these institutions [2]. The reasons for the low participation rate among private schools include the following:

- A teacher was hospitalized.
- Two teachers mentioned that the two-month timeframe was insufficient for preparation.
- A teacher reportedly dropped the final project on the way to school, and it was not repairable.
- One school only brought their display board. When asked to present the actual project, they regrettably left and did not return.
- One school did not respond to the private school coordinator.

3.1. Results of the Science Fair

Prior to the fair, a winner selection rule was established: in the event of a tie in the total score, the team with the higher score in creativity would be declared the winner. If a tie persisted, presentation scores would be used as the deciding factor, followed by demonstration scores. After all projects were judged across four categories, the judges' scores were tallied. As anticipated, two teams achieved the same total score, necessitating the application of this predetermined tie-breaking rule.

Team average scores across the four categories (maximum score per category: 15) were as follows: Creativity (10.1), Design (10.8), Demonstration (11.8), and Presentation (11.5).

The final tally resulted in the selection of one team for first place (Gold Medal), two teams for second place (Silver Medal), and three teams for third place (Bronze Medal). Each team member received a medal, a certificate, and prize money. The prize money was GHS 1,000 (\$30).

for first place, GHS 500 (\$15) for second place, and GHS 300 (\$10) for third place. The winning team was also presented with a champion trophy.

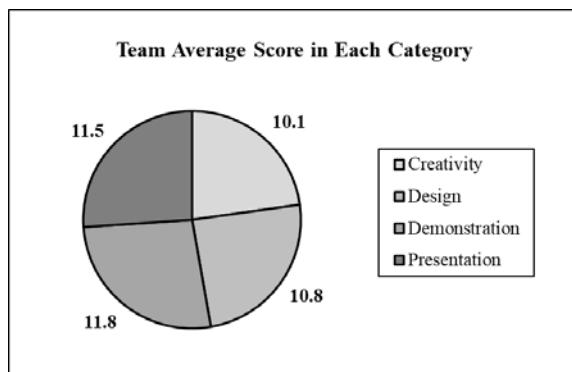


Figure 3. Team average score in each category

The medalist teams achieved average scores across all four categories that were 12% higher than the overall average.

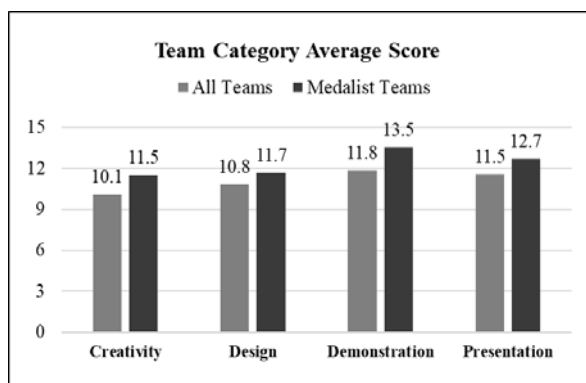


Figure 4. Team average score comparison

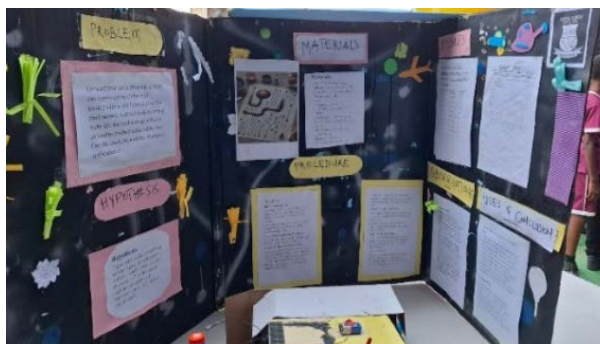


Figure 5. Project board of gold medal winning team



Figure 6. Gold medal winning team



Figure 7. Project boards of silver medal winning teams

All participants received a certificate of participation, stationery, and a book titled “Science for Anyone” written by the author.



Figure 8. Author's book was distributed to all participants

3.2. Survey Results for Science Teachers

Participant selection: Table 2 summarizes the responses in the category of participant selection.

When asked about the difficulty of selecting participants, most teachers found it easy (40% very easy, 40% easy). The majority of teachers (58%) prioritized selecting students based on their ‘creativity and innovation.’ ‘Interest and enthusiasm’ (17%) and ‘scientific understanding’ (17%) were also important factors. Some teachers considered the students’ ability to work in teams and collaborate (8%), while no teacher indicated that ‘presentation skills’ were the most important consideration.

About half of the teachers (45%) indicated that they considered the gender of students when forming their teams. This aligns with their classroom observations, which suggest that male students may exhibit greater interest in learning science compared to female students. However, a larger proportion of teachers (55%) did not concur with this observation. This is reflected in the team compositions: 45% of teams were mixed-gender, while 55% were male-only. Notably, there were no female-only teams. Overall, the majority of participants were male (77.3%).

Project preparation and support: Table 3 summarizes the responses of science teachers in the category of project preparation and support.

The majority of teachers reported that their students completed the project within 5 hours (2 teams within 3 hours, 6 teams within 5 hours). However, three teachers indicated that their students required more than 10 hours to complete their projects. Moreover, most teachers believe that their students remained highly motivated and engaged throughout the entire process (2 teams moderately, 8 teams highly)

All teachers observed that students were effective in carrying out the project with relevant science concepts, with the following distribution: 5 teams fair, 3 teams good, 4 teams very well. Regarding obtaining required materials and resources, the majority of teachers, except one, found it easy for their students (6 teams easy, 4 teams very easy).

Teachers confirmed strong school support for the science fair (80% very well, 20% good). This finding aligns with the previous study where most teachers (79%) reported that science education is highly emphasized in their school (48% very high, 31% high) [16].

These results suggest that the primary reason schools are hesitant to organize science fairs is not primarily due to a lack of materials, but perhaps due to teachers' complacency in sticking to traditional teaching methods.

Therefore, finding ways to incorporate hands-on activities into classroom instruction is essential for effective science education, while awaiting the allocation of necessary budgets by the government or educational institutions to build science labs in schools.

Table 2. Survey results in the category of participant selection and composition

1. Could you select the student participants easily?	Difficult 1 (10%)	Moderate 1 (10%)	Easy 4 (40%)	Very easy 4 (40%)
2. Did you consider the gender of the students when selecting the participants?	Yes 5 (45%)	No 6 (55%)		Maybe 0 (0%)
3. Do you think male students are more interested in learning science than female students?	Yes 5 (45%)	No 6 (55%)		Maybe 0 (0%)
4. How is your school team composed of?	Males only 6 (55%)	Male and Female 5 (45%)		Females only 0 (0%)
5. What did you consider the most when selecting students?	Interest and enthusiasm 2 (18%)	Creativity & innovation 7 (64%)	Scientific understanding 1 (9%)	Teamwork & collaboration 1 (9%)
				Presentation skills 0 (0%)

Table 3. Survey results from the inter-school science fair participating science teachers

6. How many hours do you think your students have spent completing the project?	3 hours 2 (18%)	5 hours 6 (55%)	10 hours 0 (0%)	10+ hours 3 (27%)
7. Do you think your students could get the required materials and resources easily?	Difficult 1 (9%)	Moderate 0 (0%)	Easy 6 (55%)	Very easy 4 (36%)
8. Do you think your students remain motivated and engaged throughout the entire process?	Poor 0 (0%)	Fair 1 (9%)	Good 2 (18%)	Very much 8 (73%)
9. Do you think your students collaborated well?	Poor 0 (0%)	Fair 1 (9%)	Good 4 (36%)	Very well 6 (55%)
10. How effective do you think students were in carrying out the project with relevant science concepts?	Not at all 0 (0%)	Slightly 5 (45%)	Moderately 3 (27%)	Significantly 3 (27%)
11. Do you think your school was supportive?	Poor 0 (0%)	Fair 0 (0%)	Good 2 (20%)	Very well 8 (80%)

Table 4. Survey results from the inter-school science fair participating science teachers

12. Do you think this science fair has offered students an opportunity to develop critical thinking?	Poor 0 (0%)	Fair 0 (0%)	Good 0 (0%)	Very well 11 (100%)
13. Do you think this science fair has offered students problem-solving skills?	Poor 0 (0%)	Fair 0 (0%)	Good 0 (0%)	Very well 11 (100%)
14. Do you think this science fair has offered students a deeper understanding of scientific concepts?	Poor 0 (0%)	Fair 0 (0%)	Good 1 (9%)	Very well 10 (91%)
15. How much do you think your students have increased their interest in science while preparing for this science fair?	Poor 0 (0%)	Fair 0 (0%)	Good 1 (9%)	Very well 10 (91%)
16. Based on your experience at this science fair, how likely are you to promote hands-on activities in your science class?	Not likely 0 (0%)	Slightly likely 0 (0%)	Moderately likely 1 (9%)	Very likely 10 (91%)
17. Based on your experience at this science fair, are you interested in organizing an intra-school science fair at your school?	Not likely 0 (0%)	Slightly likely 0 (0%)	Moderately likely 2 (18%)	Very likely 9 (82%)
18. What do you think are the biggest realistic barriers to hosting an intra-school science fair?	Lack of teachers' interest 0 (0%)	Lack of students' interest 1 (9%)	Inadequate funding 8 (73%)	Insufficient infrastructure 2 (18%)
19. If there were an inter-school science fair like this one, would you recommend your students to participate in it?	Not likely 0 (0%)	Slightly likely 0 (0%)	Moderately likely 1 (9%)	Very likely 10 (91%)

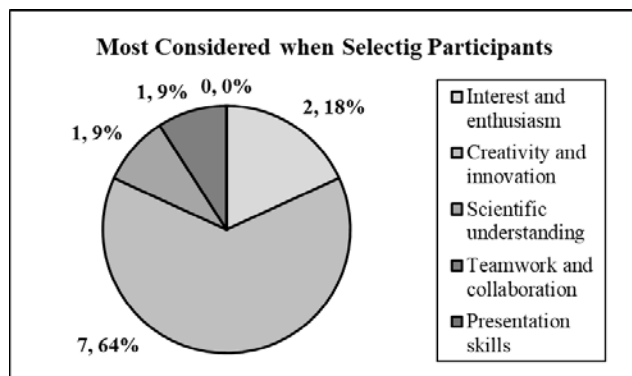


Figure 9. Teacher's consideration when selecting students

Impacts and future participation: Table 4 summarizes the responses of science teachers in the category of impacts and future participation.

Teachers positively evaluated the impacts of the preparation and participation in the science fair on their students in all aspects: problem-solving skills, deeper understanding of scientific concepts, and increased interest in science (1 team good, 10 teams very well). It is truly remarkable that even a small event like this science fair can provide students with such valuable experiences. By setting a tangible goal, students are empowered to maximize their potential.

By observing the positive impacts of the science project on their students, science teachers responded that they are likely to promote (10 teachers very likely, 1 teacher moderately likely) hands-on activities in their science classes. The success of the science fair is evident:

- All teachers (10 very likely, 1 moderately likely) would recommend students to participate in future inter-school science fairs.
- All teachers (9 very likely, 2 moderately likely) expressed interest in organizing an intra-school science fair.

The event demonstrated that a small-scale science fair could be successfully conducted in Ghana with a low budget and readily available materials. When asked about the barriers to hosting an intra-school science fair, teachers primarily cited 'inadequate funding' (73%) and 'insufficient infrastructure' (18%).

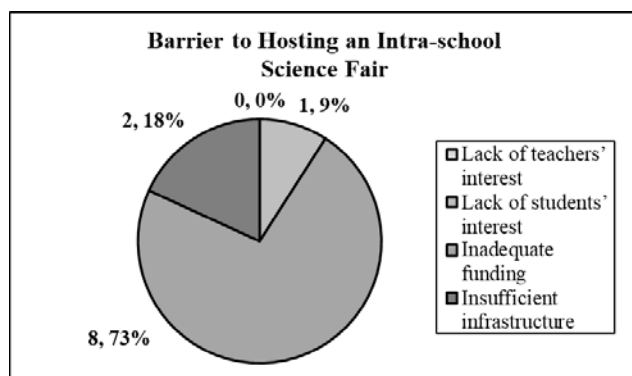


Figure 10. Barrier to hosting a science fair

These findings align with a previous study by [16] that surveyed science teachers from 46 schools in the Ningo-Prampram District. In that study, 'lack of facilities' (52%)

and 'lack of budget' (33%) were identified as the primary barriers to hosting science fairs.

This science fair demonstrates that these material limitations can be overcome by introducing various hands-on activities that utilize readily available materials. Teachers should guide students in applying science concepts to the design, demonstration, and presentation of their projects to their classmates. Through this process, students will joyfully acquire scientific knowledge. Science teachers should act as mentors as their learners engage in hands-on experimentation and invention. The author encourages science teachers to share their experiences and collaborate in organizing inter-school science fairs.

Teachers' feedback: Teachers' overall feedback was overwhelmingly positive, with several common themes emerging. Most teachers described the event as effective, educative, motivating, interesting, and insightful. One teacher expressed a willingness to organize a 'mini' science fair. Some teachers expressed a desire for the event to be organized regularly. However, some comments addressed the timing of the event, with several suggestions offered.

Firstly, a teacher wrote: "Since schools resumed not long ago, the whole project was in haste. Even though students were pre-informed before vacation, they worked only a few days before the fair." Another teacher wrote: "The event was well-organized, informative, and enjoyable. We appreciate all the efforts that contributed to the program's success. Suggestion: Preparations for the fair should commence at the beginning of the term, rather than being undertaken just before the vacation." The District STMIE coordinator confirmed that teachers and students are prohibited from meeting privately during school breaks. This may explain why some invited schools were unable to participate.

Secondly, while we encouraged participants' creativity in the science fair by allowing any idea as long as they used readily available materials, one teacher suggested, "I think all schools should be given a common topic for the science fair."

Lastly, while the projects were scored based on creativity, design, demonstration, and presentation, one teacher suggested, "The practicality of every scientific innovation or experiment should be added to the scoring criteria." The author initially agreed with this idea but later considered that it might limit students' ability to explore their interests and express their unique ideas in a creative and imaginative manner.

3.3. Survey Results for Participating Students

Table 5 provides an overview of the responses of 22 students who participated in the inter-school science fair.

STEM interest and learning experience: When asked about their career interests in STEM fields, 96% of students expressed interest, while only 5% did not. This ratio of interest in STEM fields is significantly higher than that found in the previous survey (72% 'yes') at a local school [16]. Students identified 'turning ideas into works' as their most favorite part of the science fair (36%), followed by 'acquiring science concepts' (27%),

‘practicing teamwork skills’ (27%), and ‘practicing public speaking’ (9%).

Table 5. Survey results from students who have participated in the inter-school science fair

1. Do you plan to study Science, Technology, Engineering, and Mathematics (STEM) as your career?	Yes 21 (96%)	No 1 (5%)	Maybe 0 (0%)	
2. Do you think the event helped you understand science concepts ?	Poor 1 (5%)	Fair 1 (5%)	Good 2 (9%)	Very much 18 (82%)
3. Do you think the event helped you practice and improve your teamwork skills ?	Poor 2 (9%)	Fair 2 (9%)	Good 1 (5%)	Very much 17 (77%)
4. Has this event helped improve your communication/public speaking skills ?	Poor 3 (14%)	Fair 1 (5%)	Good 4 (18%)	Very much 14 (64%)
5. Were you able to get the help and support you needed from your parents for your project?	Poor 5 (23%)	Fair 0 (5%)	Good 5 (23%)	Very much 12 (55%)
6. Were you able to get the help and support you needed from your teacher for your project?	Poor 4 (18%)	Fair 0 (5%)	Good 0 (0%)	Very much 18 (82%)
7. What challenge have you faced in preparing for or during the science fair?	Coming up ideas 4 (18%)	Getting materials 6 (27%)	Turning ideas into works 5 (23%)	Speaking in public 7 (32%)
8. What was your favorite part about participating in the science fair?	Acquired science concepts 1 (5%)	Practiced teamwork skills 0 (0%)	Turned ideas into works 1 (5%)	Practiced public speaking 20 (91%)
9. If there is another science fair in your school district, will you participate?	No 1 (5%)	Maybe 0 (0%)	Sure 1 (5%)	Absolutely 20 (91%)

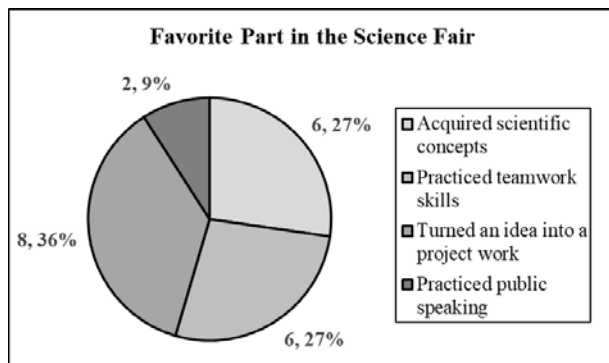


Figure 11. Favorite part in the science fair

Skill development: Most students replied that the science fair significantly enhanced their skills in all three aspects: ‘understanding science concepts’ (82% very much, 9% good), ‘teamwork skills’ (77% very much, 5% good), and ‘communication/public speaking skills’ (64% very much, 18% good). These skills can only be developed through hands-on activities. Science fairs, regardless of scale, encourage students to engage in these activities, even for the prospect of a participation certificate.

Challenges and future participation: However, students identified the following challenges they faced in preparing for or during the science fair: ‘speaking in public’ (32%), ‘getting materials’ (27%), ‘turning ideas

into works’ (23%), and ‘coming up with ideas’ (18%).

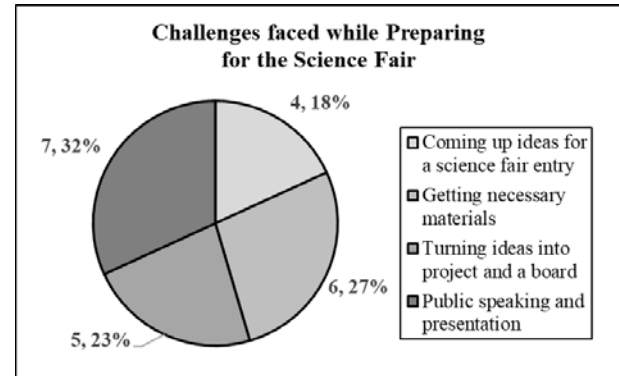


Figure 12. Challenges students faced

It seems that students lack confidence in public speaking. More opportunities should be provided for them to present their thoughts and ideas within the classroom setting. Also, it is surprising that many students had difficulties in obtaining necessary materials although they were encouraged to utilize readily available materials. Students should be guided by their teachers to identify projects that utilize viable materials from the project inception phase.

Although most students received significant support from their parents (55% very much, 23% good) and from teachers (82% very much), 23% of students reported receiving poor support from their parents and 18% reported receiving poor support from their teachers. From the correlation studies, it was discovered that the correlation between teacher support and score ($r=+0.37$) is stronger than that between parental support and score ($r=+0.03$). This indicates that teacher support is crucial for students to advance in science education.

The students’ enthusiasm for the event is evident, with an overwhelming majority (91%) confirming their interest in participating in another inter-school science fair. This science fair demonstrated that even a small-scale science fair can effectively ignite students’ interest and passion for science.

Students’ feedback: Students shared their thoughts on how to improve their science learning:

- Getting more science materials
- Implementing more practicals in class
- More support from parents, teachers and school
- Doing more science projects and participating in science related competitions like quizzes, fairs.

Correlation studies: There was not much difference in the average scores between male-male teams (44.3) and male-female teams (44.2). A weak correlation was observed between the time spent preparing projects and the scores received ($r=+0.12$). However, teams with highly motivated members secured higher scores ($r=+0.66$).

4. Conclusion

The successful organization and execution of the first inter-school science fair in the Ningo-Prampram District demonstrates how collaborative efforts between schools and educational authorities can lead to impactful learning

experiences. By involving both public and private schools and encouraging the use of local materials, the fair showcased the potential for fostering creativity, critical thinking, and problem-solving among students, even within resource-constrained environments.

The fair marked an inspiring beginning and set a hopeful precedent for future inter-school science fairs. It also highlighted the potential for individual schools to host intra-school science fairs, enabling students to enjoy and explore the wonders of science at a more localized level.

The enthusiasm generated by the fair was evident in the subsequent feedback. One teacher expressed their interest in organizing 'mini science fairs' at their school. Another school initiated a science and math quiz, posting the results on YouTube. This growing interest underscores the transformative potential of such events in making science education engaging, accessible, and impactful.

Building upon the success of this science fair, the author aims to further support science education in the region by developing accessible resources, such as science activity books. These efforts, combined with ongoing collaboration between schools and local education authorities, could pave the way for regular, low-cost science fairs and sustained student engagement in science. This journey demonstrates that with creativity, passion, and teamwork, science can become an exciting and integral part of students' educational experiences.



Figure 13. Small-scale science fair brings joy to participants

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