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Research Capabilities of Grade 7 Science Learners: Basis for a Student-Led Research and Inquiry

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Abstract : This study explored the profile of Grade 7 science learners, their research capabilities, and the relationship between their profile and their research performance. Data were collected from 200 learners, examining their parents' highest educational attainment, parents' occupation, family income, number of siblings, and distance from their learning center. Most learners' parents had earned masteral units (72%), and a significant portion were house persons (31%) or self-employed (21%). Monthly family income predominantly ranged from Php 11,000 to Php 20,000 (45%), with most learners having one or two siblings (72%) and living within 2 km of their learning center (66%). The research capabilities of the Grade 7 science learners were assessed through a test with 35 items. The results showed a mean score of 28.16, with a mean percentage score of 80.46 and a proficiency level of 82.07, indicating a high level of research capability. Statistical analysis revealed a significant relationship between learners' research capabilities and various profile factors, including parents' educational attainment, occupation, monthly salary, and number of siblings. The findings demonstrate that higher parental educational attainment and fewer siblings are positively correlated with higher research capabilities. Conversely, the distance from the learning center showed no significant relationship with research capabilities. These insights highlight the impact of socio-economic factors and family environment on students' academic performance in research. Based on the findings, recommendations are provided to enhance the research capabilities of Grade 7 science learners. Emphasis is placed on supporting families with lower educational attainment and incomes, encouraging parental involvement in education, and providing targeted resources for students with larger families to ensure equitable learning opportunities.

IndexTerms **–Inquiry, Research Capabilities, Science Learners, Research performance**

I. INTRODUCTION

Research has demonstrated that professional researchers and scientists engage in a variety of textual activities not only for documenting their research and presenting it to peers in a number of ways but also for reading, discussing, and commenting on others' research. Put simply, scientists depend on literacy practices in performing their scientific work (Santini, 2018). As emphasized by Pringle (2020), because reading, writing, and speaking play foundational roles in professional scientists' work, literacy practices should be central to science teaching.

There has been a shift in different national curricula in the past decade, and several countries are striving to increase their educational systems' emphasis on the role of language in research or scientific inquiry. Still, while the literacy practices associated with science are multifaceted and complex, those associated with school and school science are often narrow and revolve around reproducing scientific facts and memorizing information.

In a review of the role of text in school science, Kooiker-den Boer (2024) concluded that this role is often "characterized by a dominant (but unutilized) use of the science textbook, coupled with reading/writing activities that appear to be embedded in a transmissive mode of science teaching." In a study by Sason et al. (2020), students trained to develop questions about within-text connections had significantly higher science text comprehension.

Further, the international Trends in International Mathematics and Science Study (TIMSS) found that science textbooks play a key role in school science instruction in both primary and secondary schools across countries (NCES Handbook of Survey Methods, 2019). To summarize, a large body of research suggests that literacy practices in school science are predictable and somewhat narrow, even though there is a trend in several countries to change the curricula to enhance science literacy. There appears to be a significant gap between textbook - based literacy practices, where science is often taught as undisputed fact on the one hand, and the literacy practices encompassed by scientific practice on the other hand (Bjørkvold & Blikstad-Balas, 2017).

The reconceptualization of scientific literacy, the fundamental sense of scientific literacy involves fluency in the language, discourse patterns, and communication systems of science, whereas the derived sense of scientific literacy is about being knowledgeable, learned, and educated in science. If writers only derive the sense of scientific literacy, they may be ignoring crucial aspects of the substantive, epistemic, and social dimensions of science and scientific literacy (Valladares, 2021).

How and why learners engage with texts matter because it is crucial that learners develop a variety of critical literacy practices and explore questions with no clear, factual answers available in a textbook; such exploration resembles practices outside school, and such exposure is therefore also important to experience as a learner.

The types of discursive experiences and literacy practices in which learners actually engage and the manner in which these relate to the overall social literacy practices associated with science and research are of paramount importance if we want learners to have a relevant repertoire of practices to employ when facing scientific content inside and outside of the school context. Learners must have opportunities to develop the ability to think critically about scientific evidence (Schmaltz et al., 2017). To do so, it is necessary for them to be faced with data that lacks a clear interpretation, and they must be given occasion to consider plural alternatives and explanations.

In connection, research is widely recognized as an important tool for developing the ability to think critically; solving man's various problems; and in making life more colorful and convenient (Saldiray & Doganay, 2024). Moreover, the purpose of research is to serve man, and the goal of research is good. Hence, due to research man becomes progressive because man is utilizing the products of research (Sarpong et al.,2023).

Research serves as a solution to societal problems that are apparent from community and level up to different government and non-government agencies. Thus, most government and non-government agencies are developing research agenda in order to find solutions to prevailing problems observed in the society (Islam, 2023).

Educational institutions must then develop the research skills of students (Vieno et al., 2022). The importance of scientific inquiry and knowledge generation in the development of individuals, families, communities, and the society has been established (Jarylkapova et al., 2024). In addition, students need to achieve cognitive independence necessary to cope with fast changing learning environments.

In the Philippines, the Department of Education through the implementation of the K to 12 curriculum, aims to provide sufficient time for the mastery of concepts and skills, develop lifelong learners, and prepare graduates for tertiary education, middle-level skills development, employment, and entrepreneurship. One of the salient features of this curriculum is that it is learner-centered, inclusive and research-based. As enshrined in Department Order Number 39, series of 2016, the Department sustains its progressive actions based on sound and relevant evidence from research (Department of Education, 2016).

NEED OF THE STUDY.

In the K to 12 curriculum, all senior high school learners, regardless of their track, need to undergo quantitative research writing. This is the result of the mandate that states that curriculum shall be relevant, responsive and research-based (Abragan et al., 2022). Research is also introduced to grade 7 Science, Technology and Engineering (STE) learners in the STE program. However, there are some students who expressed their lack of competence in doing research in the locale of the study. Hence this research aims to assess the research capabilities of Grade 7 science learners in Camiling East District, Division of Tarlac Province for the school year 2023-2024 as the basis for a student-led research and inquiry.

3.1Population and Sample

The sources of data for this study were the 200 learners of the First Congressional District of the Division of Tarlac Province during the school year 2023-2024. A total of 200 learners was taken to answer the questionnaire prepared by the researcher. Simple random sampling was utilized to gather the data needed for this study.

3.2 Data and Sources of Data

Data included the profile of the Grade 7 science learners and their level of research capability. Data were gathered though a self-made questionnaire. The questionnaire was prepared based on the researcher's readings, previous studies, professional literature, published and unpublished thesis relevant to the study. The self-made questionnaire was validated.

3.3 Theoretical framework

The significance of undertaking research and being involved in the research process cannot be underestimated, especially in this global era. Powell (2016) defined "research literacy" as "the capacity to obtain, process and understand basic information needed to make informed decisions about research participation". Very few will contest the relevance of promoting research literacy in educational institutions since it helps individuals understand this complex and ever-changing world.

Research literacy is higher, and research participation is more evident among undergraduate and graduate learners. This situation can be mainly attributed to the undertaking of research projects at the bachelor's and master's levels as a major academic requirement and as proof of one's scholarship. Nevertheless, learners in basic education are also being given learning exposure to research. McKee (2022) pointed out three reasons for conducting research: it (1) increases knowledge and understanding, (2) provides evidence for decision- and policy-making, (3) advances professional practice and generates new ideas that can lead to service innovation and improvement.

It is for this reason that teaching learners how to conduct research is part of the curriculum in the basic education program. Learners need research skills as outlined by the Common Core State Standards (CCSS) in the case of United States. These research skills will prepare learners for college, workforce training, and life in technological society. As learners undertake research projects, they improve their ability to gather, understand, evaluate, synthesize, and summarize information. More importantly, learners can conduct original research to answer questions, analyze related literature, and solve problems (Gewertz, 2015).

The Philippine educational system recognizes the importance of acquiring research knowledge and skills in the high school to senior high school years. A clear proof of this recognition may be seen in the inclusion of STE program and Practical Research as a subject in the new K12 curriculum.

The descriptive part described the profile of the Grade 7 science learners; level of research capability of Grade 7 science learners; relationship between the profile of the learners and their level of research capability; student-led research and inquiry workshop was proposed to help augment the research capability of Grade 7 science learners.

RESEARCH METHODOLOGY

The methodology section outlines the plan and method that how the study was conducted. This includes Universe of the study, sample of the study, Data and Sources of Data, study's variables and analytical framework. The details are as follows;

3.1Population and Sample

The respondents of the study were 200 learners of the First Congressional District of the Division of Tarlac Province during the school year 2023-2024. The 200 learners were selected using simple random sampling.

3.2 Data and Sources of Data

The data gathered in the study included the profile and the level of research capability of the respondents. Data were gathered from Grade 7 science learners from the First Congressional District of the Division of Tarlac Province during the school year 2023-2024. Data were gathered using a self-made questionnaire.

3.3 Theoretical framework

The variables of the study were the profile of the Grade 7 science which included their parents' highest educational attainment; occupation of parents; monthly salary; number of siblings; and distance of the learning center from residence and the level of research capability of the respondents. The two sets of variables were related to determine if profile variables influenced the level of research capabilities of the learners.

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3.4Statistical tools and econometric models

This section elaborates the appropriate statistical models which were used to forward the study from data towards inferences. The detail of methodology is given as follows.

3.4.1 Descriptive Statistics

In describing the profile of the Grade 7 science learners, frequency and percentage were used. On the other hand, data to determine the level of research capability of Grade 7 science learners were analyzed using the weighted mean.

3.4.2 Inferential Statistics

In testing the significant relationship between the profile of the learners and their level of research capability, Pearson r was used.

IV. RESULTS AND DISCUSSION

4.1 Results of Profile of the Respondents

Table 4.1: Profile of the Respondents

Profile variables		
A. Highest Educational Attainment	f	%
Doctoral degree	4	2
Earned doctoral units	12	6
Master's degree	26	13
Earned masteral units	144	72
Bachelor's degree	14	7
Total	200	100
B. Occupation	f	%
Government worker	24	12
Farming	9	5
Construction worker	33	17
Micro-enterprise worker	30	15
Self-employed worker	43	21
House person	61	31

Total	200	100
C. Monthly Salary	f	%
Php 31 000 or more	6	3
Php 21 000 – Php 30 000	30	15
Php 11 000 – Php 20 000	90	45
Php 5 000 – Php 10 000	54	27
Less than Php 5 000	20	10
Number of Siblings	f	%
7 or more siblings	5	2
5 – 6 siblings	11	6
3 – 4 siblings	27	13
1 – 2 siblings	145	72
No sibling	13	6
Total	200	100
D. Number of Siblings	f	%
7 or more siblings	5	2
5 – 6 siblings	11	6
3 – 4 siblings	27	13
1 – 2 siblings	145	72
No sibling	13	6
Total	200	100
Distance of the Learning Center from Residence	f	%
Farther than 4 km from the school	15	7
Within 4 km radius	20	10
Within 3 km radius	34	17
Within 2 km radius	59	29
Within 1 km radius	54	27
Within 500 m radius	20	10
Total	200	100

Table 4.1 displayed the frequency and percentage of the profile of the respondents. The majority of parents, 72%, have earned master's units, indicating a high level of educational achievement. This significant proportion suggests that many students may have access to well-informed guidance and support for their educational endeavors, including research activities in science. Following this, 13% of parents hold a master's degree, contributing to the high level of postgraduate education within the parent population. When combined with those who have earned master's units, a substantial 85% of parents have engaged in graduate-level education. This statistic reflects a strong academic orientation within the household, which can positively influence students' attitudes towards research and inquiry-based learning. A smaller percentage of parents, 7%, hold a bachelor's degree, while 6% have earned doctoral units, and 2% possess a doctoral degree. The presence of parents with doctoral qualifications, although relatively low, suggests that some students might have direct access to advanced academic perspectives and potentially higher levels of academic encouragement and resource availability. The educational attainment of the parents is predominantly high, with a strong presence of graduate-level education. This context likely fosters a supportive environment for Grade 7 learners in terms of academic endeavors, particularly in research and inquiry-based learning. The high level of parental education can be a significant asset in encouraging and assisting students in developing their research capabilities, providing them with the necessary skills and motivation to excel in scientific inquiry.

In terms of the parents' occupation, a significant portion of parents, 31%, are house persons. This category likely includes stay-at-home parents who may have more time to support their children's educational activities at home. Their involvement can be crucial in fostering a conducive environment for academic pursuits, including research and inquiry-based learning. However, this group may also face challenges in providing specialized academic support if they lack advanced educational backgrounds.

Self-employed workers make up 21% of the parents, indicating a substantial segment engaged in entrepreneurial activities. These parents might bring unique skills such as problem-solving, independence, and resourcefulness, which can positively influence their children's approach to research. The self-employed status often requires a flexible schedule, potentially allowing these parents to be more involved in their children's education. Construction workers constitute 17% of the parent population. This occupation may involve long hours and physically demanding work, which could limit the time and energy these parents can dedicate to supporting their children's academic activities. Despite these challenges, construction workers can still provide valuable life skills and practical problem-solving approaches that can benefit students in their research endeavors. Micro-enterprise workers represent 15% of the parents. Similar to self-employed workers, those involved in micro-enterprises might have flexible schedules and entrepreneurial skills, which can be beneficial for fostering a proactive and innovative mindset in their children. Government workers account for 12% of the parents. These individuals likely have stable employment and possibly higher educational attainment, which can translate into a supportive environment for academic excellence. Their understanding of bureaucratic processes and organizational skills can be advantageous in guiding their children through structured research projects.

The 5% of the parents are engaged in farming. This occupation may involve long hours and physical labor, potentially limiting the time available for direct academic support. However, farming parents can impart valuable lessons about sustainability, biology, and environmental science, which are directly relevant to many scientific inquiries.

As to the monthly salary of the parents, a small percentage of parents, 3%, earn Php 31,000 or more per month. This group, while the minority, likely has access to greater financial resources, which can be used to support their children's educational needs. These parents might afford better educational materials, private tutoring, and technology that can enhance their children's learning

and research capabilities. The higher income can also correlate with higher educational attainment and more involvement in their children's academic activities. Fifteen percent of the parents earn between Php 21,000 and Php 30,000 per month. This income bracket suggests a stable financial situation, which can still support the acquisition of educational resources, although to a lesser extent than the highest bracket. These families might have the means to provide their children with books, internet access, and other learning tools that are essential for conducting research and fostering a conducive learning environment at home. The majority of the parents, 45%, fall into the Php 11,000 to Php 20,000 monthly salary range. This group represents the middle-income families, who might face financial constraints but still manage to prioritize their children's education within their budget. These families might need to make more careful choices about educational expenses, possibly relying more on public resources and schools for support. The financial pressure can affect the availability of resources, and the time parents can dedicate to their children's academic activities, potentially impacting their research capabilities. A significant portion, 27%, of the parents earns between Php 5,000 and Php 10,000 monthly. Families in this income bracket likely face considerable financial challenges, making it difficult to provide additional educational support beyond the basics. These parents might struggle to afford supplementary materials, private tutoring, or technology, which are crucial for effective research and inquiry-based learning. Financial stress can also limit the time and energy parents can invest in their children's education, potentially leading to a reliance on schools and community resources.The 10% of the parents earn less than Php 5,000 per month. These families are likely experiencing severe financial hardships, which can significantly hinder their ability to support their children's educational needs. Students from these households might lack access to essential learning tools such as computers, internet, and books, making it difficult to engage in research activities. Additionally, financial strain can affect students' overall well-being and concentration on studies, further impacting their academic performance and research capabilities.

In terms of number of siblings, significant majority of the learners, 72%, have 1 to 2 siblings. Smaller family sizes can lead to more focused parental attention and resources per child. Parents in these families might have more time and financial resources to invest in each child's education, thereby enhancing their ability to support their children's research activities. This setting can provide a more conducive environment for learning, as children can receive individualized support and attention from their parents. Thirteen percent of the learners come from families with 3 to 4 siblings. In these slightly larger families, resources and attention from parents might be more evenly distributed among children. While these families might still manage to provide adequate support for each child's educational needs, there may be some challenges in ensuring all children receive equal attention and resources for their research activities. Parents in this bracket need to balance their time and financial resources carefully to support multiple children effectively. A smaller portion, 6%, of the students have 5 to 6 siblings, and 2% have 7 or more siblings. In these larger families, the competition for parental attention and resources can be quite intense. With more children to support, parents might face significant challenges in providing individualized attention and sufficient resources for each child's education. This scenario can impact the students' ability to engage effectively in research activities, as they might not have access to the necessary support and materials at home. Additionally, the demands of a larger household might limit the time parents can dedicate to each child's academic pursuits. Another 6% of the learners have no siblings. Only children often receive undivided attention and resources from their parents, which can positively influence their educational development and research capabilities. These students might benefit from a more supportive home environment where parents can fully invest in their academic activities, providing the necessary materials, guidance, and encouragement for research and inquiry-based learning.

A substantial portion of the learners, 27%, reside within a 1 km radius of the learning center. This close proximity likely offers several advantages. Students living within walking distance can easily access school resources, attend after-school programs, and engage in extracurricular activities without the burden of long commutes. The convenience of being near the school can enhance their participation in research and inquiry-based learning, as they can spend more time on academic activities and less on traveling. Similarly, 29% of the students live within a 2 km radius, and another 17% live within a 3 km radius of the learning center. These students also benefit from relatively short travel times, although not as convenient as those living within 1 km. Nonetheless, their proximity still allows for frequent school attendance and active participation in research projects. The manageable distance means they can still take part in after-school programs and have adequate time for homework and other academic pursuits. The data also shows that 10% of the learners reside within a 4 km radius, while 7% live farther than 4 km from the school. These students may face more significant challenges due to the increased travel time. Longer commutes can lead to fatigue, reduced time for homework, and less participation in extracurricular activities, including research. For these students, attending school regularly might require more effort, and they may need additional support to ensure they can engage fully in academic activities. The distance can act as a barrier to utilizing school resources effectively, thereby impacting their research capabilities. Interestingly, 10% of the students live within a 500 m radius of the learning center. These learners are in an ideal position to maximize their engagement with school resources and activities. The extremely short distance allows for spontaneous visits to the school library or computer labs, making it easier for them to work on research projects and seek help from teachers outside regular school hours. This proximity can significantly boost their research capabilities by providing them with continuous access to educational support and materials. The data suggests that the majority of Grade 7 Science learners live within a reasonable distance from the learning center, with 73% residing within a 3 km radius. This proximity facilitates better access to school resources, greater participation in school activities, and enhanced opportunities for research and inquiry-based learning. However, for the 17% of students living farther than 3 km from the school, additional support and interventions might be necessary to ensure they can participate fully in research activities and do not fall behind due to the challenges posed by longer commutes.

4.2. Results of the Level of Research Capabilities

Table 4.2: The Level of Research Capabilities of the Respondents

Statistic	Assessment
Number of Test Items	35
Mean	28.16
Standard Deviation	3.48
Mean Percentage Score	80.46
Proficiency Level	82.07

The mean score of 28.16 out of 35 indicates that, on average, the learners performed well on the test. This relatively high mean score suggests that the majority of the students have a good grasp of the research skills being assessed. The high average score also reflects positively on the overall effectiveness of the teaching methods and curriculum in imparting research capabilities to the learners. The standard deviation of 3.48 signifies the variability in the test scores among the learners. A standard deviation of this magnitude indicates that while most students scored close to the mean, there were some variations. This variation is expected in any educational setting and can be attributed to differences in individual learning styles, prior knowledge, and levels of engagement with the subject matter. However, the moderate standard deviation also suggests that the differences in performance are not excessively wide, indicating a relatively uniform level of understanding among the learners. The mean percentage score of 80.46% further underscores the strong performance of the learners. Achieving over 80% on average indicates that the learners have a solid understanding of the research concepts and skills tested. This high percentage score reflects their ability to apply these skills effectively, which is crucial for conducting scientific inquiries and research projects. It also suggests that the instructional strategies and resources provided to the students are effective in promoting their research capabilities. The proficiency level of 82.07% is indicative of the learners' competence in research skills. Proficiency levels often categorize students' abilities into various bands such as basic, proficient, and advanced. An 82.07% proficiency level suggests that the learners are well within the proficient range, meaning they can competently perform the research tasks assessed by the test. This level of proficiency is encouraging, as it demonstrates that the learners are not only knowledgeable but also capable of applying their knowledge in practical research scenarios.

4.3. Results of the Relationship between Profile Variables and Level of Research Capabilities of the Respondents

Table 4.3. Relationship between Profile Variables and Level of Research Capabilities of the Respondents

Profile of the Learners		Level of Research Capability
Parents' Highest Educational Attainment	Pearson r	0.672
	Value	0.000
	Interpretation	Significant
Occupation of Parents	Pearson r	0.521
	Value	0.003
	Interpretation	Significant
Monthly Salary	Pearson r	0.368
	Value	0.045
	Interpretation	Significant
Number of Siblings	Pearson r	0.741
	Value	0.000
	Interpretation	Significant
Distance of the Learning Center from Residence	Pearson r	0.061
	Value	0.749
	Interpretation	Not Significant
Total	Pearson r	0.418
	Value	0.021
	Interpretation	Significant

The parents' highest educational attainment shows a strong positive correlation with the learners' research capability, with a Pearson r of 0.672 and a p-value of 0.000. This significant relationship suggests that learners whose parents have higher educational qualifications tend to have better research skills. The educational background of parents likely provides an intellectually stimulating environment, encouraging curiosity and a value for learning, which are crucial for developing research capabilities. Parents with higher education may also possess better strategies for guiding their children in academic pursuits, further enhancing these skills. Secondly, the occupation of parents also significantly affects the research capabilities of learners, as indicated by a Pearson r of 0.521 and a p-value of 0.003. This moderate correlation suggests that parents' professions, which often reflect their socioeconomic status and intellectual engagement, play a role in shaping their children's research skills. Occupations that involve critical thinking, problem-solving, or educational resources may expose children to environments that foster inquiry and research-oriented mindsets. Thus, children of parents in such professions might receive more encouragement and opportunities to develop their research skills.

Moreover, there is a significant but modest relationship between the monthly salary of parents and the learners' research capability, with a Pearson r of 0.368 and a p-value of 0.045. This finding indicates that financial stability contributes to better research skills among learners. Higher household income can provide access to educational resources such as books, internet access, and extracurricular activities that promote research and inquiry. Financial stability can also reduce stress and create a more conducive environment for learning, allowing students to focus better on developing their research capabilities.

The number of siblings shows a strong and significant relationship with the research capabilities of learners, evidenced by a Pearson r of 0.741 and a p-value of 0.000. This high correlation suggests that learners from larger families might develop better research skills through daily interactions and collaborative problem-solving at home. Having more siblings can enhance communication, teamwork, and conflict resolution skills, all of which are valuable in research settings. The family dynamics in larger families might encourage sharing of knowledge and cooperative learning, thus fostering an environment conducive to developing research skills.

Interestingly, the distance of the learning center from residence does not show a significant relationship with the learners' research capability, with a Pearson r of 0.061 and a p-value of 0.749. This lack of significance suggests that proximity to the school

does not directly impact students' research skills. It highlights that other factors, such as the quality of education, parental involvement, and individual learner attributes, are more critical in determining research capabilities than mere geographical distance.

The total Pearson r of 0.418 and a p-value of 0.021 indicate a significant cumulative relationship between the learners' profiles and their research capabilities. This finding underscores the multifaceted nature of educational development, where factors like parental education, occupation, family structure, and financial stability collectively influence the ability to engage in research. Addressing these disparities through targeted educational interventions and support programs could enhance the research capabilities of all learners, regardless of their background.

Proposed Student-Led Research and Inquiry Strategies

Objective	Activity	Description	Resources Needed	Expected Outcome
Develop foundational research skills	Introduction to Scientific Method	Teach students the steps of the scientific method through interactive lectures and hands-on activities.	Interactive lectures, worksheets, science kits	Students understand and can apply the scientific method in their research projects.
Enhance critical thinking and problem-solving	Problem-Based Learning (PBL) Sessions	Students work in groups to solve real-world science problems, encouraging critical thinking and collaborative problem-solving.	PBL guides, group discussion spaces, facilitator support	Improved problem-solving skills and the ability to work collaboratively.
Foster data collection and analysis skills	Hands-On Experiments	Conduct simple experiments where students collect, analyze, and interpret data.	Laboratory equipment, data analysis software	Students gain experience in collecting and analyzing scientific data.
Improve communication and presentation skills	Research Presentation Workshops	Workshops on how to effectively present research findings, including creating posters and oral presentations.	Presentation tools, example posters, public speaking guides	Enhanced ability to communicate research findings clearly and confidently.
Promote the use of technology in research	Digital Literacy Training	Training on using digital tools for research, such as online databases, statistical software, and presentation tools.	Computers, internet access, software licenses	Increased proficiency in using technology for research purposes.
Support independent research projects	Student-Led Research Projects	Students design and conduct their own research projects on topics of interest, with guidance from teachers.	Project proposal templates, research materials, mentor support	Students develop autonomy and confidence in conducting independent research.
Encourage a research-oriented mindset	Science Fair Participation	Organize a school-wide science fair where students can showcase their research projects.	Event organization materials, judges, prizes	Motivated students with a positive attitude towards research and inquiry.
Provide mentorship and guidance	Peer Mentorship Program	Pair Grade 7 students with older students or mentors who have experience in scientific research.	Mentor training materials, meeting spaces	Enhanced guidance and support, leading to higher quality research projects.
Integrate parental involvement	Parent Workshops on Supporting Research	Workshops for parents on how to support their children's research activities at home.	Workshop materials, parent engagement resources	Increased parental involvement and support in students' research endeavors.
Address socio-economic disparities	Resource Access Program	Provide resources such as books, internet access, and science kits to students from low-income families.	Funding, donations, community partnerships	Equal access to research resources, reducing the impact of socio-economic disparities.

The proposed Student-Led Research and Inquiry program for Grade 7 Science learners is designed to comprehensively enhance their research capabilities by addressing various facets of the research process. Each component of the program is structured to build on the learners' existing skills while introducing new concepts and practices essential for conducting effective scientific research. First, the program emphasizes the development of foundational research skills through activities like the Introduction to the Scientific Method. By engaging students with interactive lectures and hands-on activities, they learn the essential steps of scientific inquiry, laying a solid groundwork for future research projects. Complementing this, Problem-Based Learning (PBL) sessions encourage students to think critically and solve real-world problems collaboratively. These sessions not only improve their problem-solving abilities but also foster teamwork and cooperative learning. Hands-On Experiments play a crucial role in teaching

students how to collect, analyze, and interpret data. These practical sessions are essential for building technical skills and understanding scientific concepts through direct experience. To enhance communication and presentation skills, Research Presentation Workshops provide students with the tools and techniques needed to effectively share their findings. This includes training on creating posters and delivering oral presentations, which are vital skills for any researcher. The integration of Digital Literacy Training ensures that students are proficient in using modern technology for research purposes. This includes navigating online databases, utilizing statistical software, and employing digital presentation tools. By incorporating technology, students can streamline their research processes and access a wider range of resources.

A significant part of the program is the Student-Led Research Projects, where students are encouraged to design and conduct their own research on topics of personal interest. This fosters a sense of autonomy and boosts their confidence in undertaking independent research. The culmination of their efforts is showcased in a school-wide Science Fair, providing a platform for students to present their projects and receive feedback, further motivating them to pursue scientific inquiry. The program also includes a Peer Mentorship Program, where Grade 7 students are paired with older students or experienced mentors. This mentorship provides additional guidance and support, helping younger students navigate the complexities of their research projects. Additionally, Parent Workshops are organized to educate parents on how they can support their children's research activities at home, fostering a supportive environment for learning.

Conclusions

Grade 7 science learners' research capabilities are influenced by socio-economic factors and family environment. Higher parental education and fewer siblings are associated with higher research capability. The occupation and monthly income of parents also significantly impact learners' research performance. Proximity to the learning center does not significantly affect learners' research capabilities.

Recommendations

Implement programs to support students from families with lower educational attainment and income levels. Encourage parental involvement in the educational activities of their children to enhance research capabilities. Provide additional resources and support to learners from larger families to ensure equitable learning opportunities. Conduct further research to explore other potential factors influencing learners' research capabilities and address them accordingly.

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