The difficulties that beset senior high school students in research writing and presentations

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Article Info

ABSTRACT

Writing and presenting research are endeavors that senior high school students have to hurdle in the Philippines. Therefore, this research aimed at unravelling the dimensions of the difficulties faced by senior high school students in their research writing and research presentations through a sequential qualitative mixed-methods design. Primary data was gathered through a qualitative survey of 448 students, while secondary data was obtained via 10 focus groups with 7-10 members representing the different strands in one private senior high school in Baguio City, Philippines. All these participants were selected using combined quota and purposive sampling. Thematic analysis coupled with an iterative procedure was utilized to treat the harvested qualitative data. Findings revealed that the dimensions of the difficulties faced by student-researchers in research writing are health-related, manuscript-related, people-related, and resources-related, while the dimensions in research presentations are inner-directed and outer-directed. This research adds to the current body of knowledge, can contribute to achieving the United Nations sustainable development goal 4.5 and 4.7 on equal education access and global citizenship skills, and recommends research trajectories.

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1. INTRODUCTION

To enhance the basic education program in the Philippines, to be at par with other countries, and to produce globally competitive high school students, Republic Act No. 10533 series 2012 was signed which aimed at adding two more years to the old 10-year pre-university cycle [1]. This program is now commonly known as the K-12 program. Part of this K-12 program is the inclusion of applied track subjects in research. These subjects are practical research 1 and practical research 2.

Practical research 1 focuses on honing the critical thinking skills of students through qualitative research, whereas practical research 2 focuses on developing the same skills but with quantitative research [2]. These subjects seek to enable students to produce and share information in their fields of interest and, generally, develop their skills as capable community problem-solvers and practical researchers because it is the best way to understand a topic and the basis of every accomplishment or advancement no matter what the discipline is being explored [3]. As a topic and a means of instruction, the goal of research is to give learners a way to grow their ability to critically solve problems and develop interpersonal skills [4]. As a discipline, research holds the students with the matter, manner, or problems in their own field [5].

Students' attitudes [6]–[9], capabilities [5], [10], [11], and challenges [12], [13] toward research subjects have been investigated by previous researchers. Although students acknowledged that learning research is beneficial and pertinent to daily life [14], an important part of their education, and an important means to complete such activities [9], many students have biases toward research as they recognize that the subject is difficult and challenging [5]. Similarly, Manrique-Gallos [8] found that the level of anxiety of students is directly related to their attitude toward research. The lower their anxiety level, the more positive attitude they have concerning research. Furthermore, Vossen *et al.* [9] found through an experiment that students who took additional training in research generally have more positive attitudes toward doing research and design activities than those students who had regular training. Therefore, a student's attitude toward research is a good indicator of his or her research skills development, which can influence the student's inclination to perform research [15]. The capability of students in conducting research is also an apt consideration. Estacio *et al.* [10] found that students were capable of reviewing related literature and interpreting research results but had difficulty with the nature of inquiry and methodology. In fact, Santos [16] mentioned that students are highly competent in delivering written research methods, collecting and analyzing data, drawing logical findings, and offering recommendations based on those conclusions. Students recognize several challenges which include the intricacies of the subject, the time requirement, issues with their teachers and groupmates, and the bulk of other activities [17]. Correspondingly, Siguan and Ecija [18] found that 75% of student-researchers felt that their compliance and completion of the research were significantly hampered by financial restrictions. At the same time, 71% of students stated that the most challenging part of conducting research is the limited time due to other subjects' requirements [6].

Apart from writing the research paper, available literature showed that oral presentations or oral defenses play a significant role in the success of student-researchers. Lau *et al.* [19] expressed that researchers give importance to the preparation of oral defense as it is regarded not only as the pinnacle of years of hard work but also fulfills a multi-faceted function that includes examination, initiation, and celebration. In other words, it serves as a culmination of the whole study. Oral defenses pose a significant difficulty to researchers and so they apply varied mechanisms to deal with the oral presentations [20]. Consequently, oral defenses result in anticipatory anxiety and sustain high sympathetic nervous system activation of researchers regardless of the language used during the presentation [21].

Overall, this study is noteworthy because it offers a more thorough understanding of the challenges senior high school students in the Philippines encounter while composing and presenting their research. The specific experiences of senior high school students are worth investigating since majority of studies concentrate on the research difficulties faced by college students. The focus on writing and presentation, which is uncommon in earlier studies, adds freshness to the literature. Also, educational institutions might leverage the unique challenges found in the study to develop focused responses. Ultimately, this study is the first to identify six dimensions of research difficulties among senior high school students using a sequential qualitative mixed method design.

With the new Philippine curriculum called K-12, students in senior high are required to take practical research 1 and 2 subjects where the first becomes a prerequisite of the other. In the senior high school where the data were collected, practical research 1 and 2 are taken by grade 12 students in the first and second trimesters of every school year. Students in the chosen locale of this study are required to orally defend their papers both in practical research 1 and practical research 2. These oral presentations include a topic defense focusing on the chosen topic and specific problems; a proposal defense pivoting on the introduction and methodology parts of their papers; a final defense focusing on the findings/results and discussion, the conclusions, and recommendations; and other parts of the paper.

Previous studies have been conducted exploring the difficulties faced by undergraduate students in the conduct of writing theses and research writing in general [13], [22], [23]. Nevertheless, the challenges experienced by senior high school students in the Philippines in conducting their research delving into the aspects of writing and oral presentations have yet to be explored deeper. It is also notable that while studies extensively explored topics relating to writing theses and dissertations, oral assessment forms such as presentations or defenses have been largely unmapped [24].

This study aims to explore the difficulties faced by senior high school students in their practical research subjects. This study is guided by the research question: what are the dimensions of the difficulties faced by senior high school researchers in their research writing and research presentations? Through this study, the findings aim to contribute to the growing body of knowledge on the difficulties faced by senior high school researchers in their research writing and research presentations and offer some insights on how teacher training can capacitate the general capabilities and performance of senior high school students thereby contributing to the realization of United Nations sustainable development goal 4.5 and 4.7.

This study is anchored on multiple theories that support the difficulties of students in research writing and presentation. The complexity of the research process is supported by the cognitive load theory,

which identifies the working memory as the conscious process of thinking. Since the working memory is limited, students may struggle when too much information and tasks are given without scaffolding [25]. Furthermore, experiential learning theory demonstrates that student engagement is enhanced through hands-on, reflective learning experiences. It emphasizes that students should actively participate in all aspects of learning, as experience is crucial to the learning process [26]. In the same way, students learn better when they are engaged in the conduct of research, from topic generation to research presentation.

To add, constructivist learning theory views learning as an active process where people build their own understanding. This process happens largely through social and cultural interactions, not just individually. Social constructivism emphasizes that effective teaching and learning are fundamentally reliant on social interaction and group discussions, thus relating to the conduct of research where peer collaboration and teacher support are necessary [27]. Additionally, guidance and support from teachers as advisers are supported by the zone of proximal development (ZPD). The ZPD emphasizes that a student can accomplish activities more successfully with the guidance of a more proficient individual [28]. Without expert scaffolding through teacher mentorship and research guidance, students will not progress to higher research skills independently.

The confidence of students in research writing and presentation is underpinned by the self-efficacy theory. Self-efficacy is an individual's belief in their ability to succeed in specific situations or accomplish a task. Research indicates that self-efficacy functions as a pivotal internal motivational process which in turn affects the degree of effort exerted, the level of persistence demonstrated, and the ultimate attainment of goals [29]. Students who have low confidence may have poor performance not only in writing research papers but also in their research presentation. Additionally, self-determination theory supports the student engagement in research. Self-determination theory details the process for understanding the development of motivation and its impact on human behavior and well-being. The theory posits that the emergence of high-quality motivation and optimal functioning is contingent upon the fulfillment of three fundamental psychological needs including the need for relatedness, the need for competence, and the need for autonomy [30].

Finally, in the context of oral defense, students may underperform in presentations due to speech anxiety. This is supported by the communication apprehension theory, which is the feeling of anxiety or fear someone experiences when they must communicate with others. This fear of participating can negatively impact a student's academic success and their ability to learn, especially in terms of their cognitive, affective, and psychomotor skills [31].

2. METHOD

2.1. Research design

A sequential qualitative mixed method design was incorporated in this study because the investigators combined two qualitative techniques. The primary component was achieved through a qualitative survey, while a series of focus group discussions (FGDs) served as the supplemental component [32]. In this way, the researchers gained a deeper understanding of the dimensions of the difficulties faced by senior high school researchers in their research writing and research presentations [33], [34].

2.2. Site and participants

Through a combined quota and purposive sampling techniques, 448 senior high school students during the third trimester of the school year 2022-2023 in one private school in Baguio City, Philippines participated in the online survey. The criteria were as: i) enrolled in senior high school at the chosen private school during the conduct of the study; ii) belonged to one of the strands in science, technology, engineering, and mathematics (STEM), humanities and social sciences (HUMSS), accountancy, business, and management (ABM), general academic strand (GAS), information and communications technology (ICT), or home economics (HE) which served as the quota in the study [35]; iii) attended the final defense of his/her research; and iv) willing to participate in the online survey. To be specific, 126 senior high school students responded to the online survey from STEM, 149 from HUMSS, 128 from ABM, 24 from ICT, and 21 from HE. Through invitation letters, the researchers were able to gather 10 groups consisting of 7-10 members across senior high school strands for the FGDs, which was more than adequate to enrich and clarify the themes created through the online survey since Hennink and Kaiser [36] suggested that 4-8 focus groups are sufficient to reach data saturation. Overall, 23 senior high school students participated from STEM, 21 from HUMSS, 21 from ABM, 8 from ICT, and 8 from HE.

2.3. Instrumentation

The core corpus of data was collected via a qualitative survey validated by an expert with a doctorate degree. A Google Form was created containing five open-ended questions to survey the

difficulties faced by senior high school researchers in the following: i) research paper writing; ii) research presentation/oral defense; iii) group members; iv) research advisers; and v) other difficulties. The secondary instrument was an interview protocol validated by an expert with a doctorate degree, specifically created based on the findings of the qualitative survey. The researchers crafted 16 questions to elicit specific responses about the difficulties faced by senior high school researchers in research paper writing, 6 questions in research presentation/oral defense, 4 questions in relation to their group members, 6 questions in relation to their research advisers, and 4 questions in relation to other difficulties.

2.4. Data gathering procedure

Since one of the researchers was the research coordinator in the selected site, the researchers had to seek assistance from research advisers across senior high school strands to distribute the consent letter as well as the qualitative survey via Google Form. Thereafter, the research advisers had to send the Google Form to their respective group chat rooms on Facebook Messenger. After two weeks of data collection, thematic analysis ensued. The next step was to recruit informants for the FGDs via request letters which also contained the questions to be asked. The researchers once again capitalized on the research advisers for this matter. Once the schedules were set with the approval of the participants, the researchers moderated the recorded FGDs online via Zoom and Google Meet video teleconferencing. The FGDs ran approximately 65 minutes. After quite some time, the researchers ensured that the transcripts of the FGDs were sent personally to the participants on Facebook Messenger for feedback or member check [37].

2.5. Analysis of data

The descriptive phenomenology of Sundler *et al.* [38] was utilized to thematically analyze the data from the online survey. The whole process involved having a sense of familiarity with the volumes of responses from the senior high school students by reading each response with an open mind. This was followed by attempting to search for meanings and preliminary themes and organizing the themes into a cohesive whole. Furthermore, the researchers needed to integrate an iterative procedure by analyzing and reviewing not only the findings in the qualitative survey but also the responses of the senior high school students in the FGDs over and over again [39]. This process entailed both individual and group discussions among the researchers to reconcile similarities and differences in the codes to produce the final themes and subthemes [40], [41]. Finally, the findings were reported, as suggested by Sundler *et al.* [38], according to the themes, descriptive texts, and quotes lifted from the responses during the FGDs. Pseudonyms were used to conceal the identity of the informants for ethical considerations.

3. RESULTS AND DISCUSSION

Through a combination of two qualitative techniques in harvesting data, the researchers identified several dimensions of the difficulties faced by senior high school students in their research writing. These dimensions include challenges related to health, manuscript preparation, people, and resources. Figure 1 illustrates these dimensions.
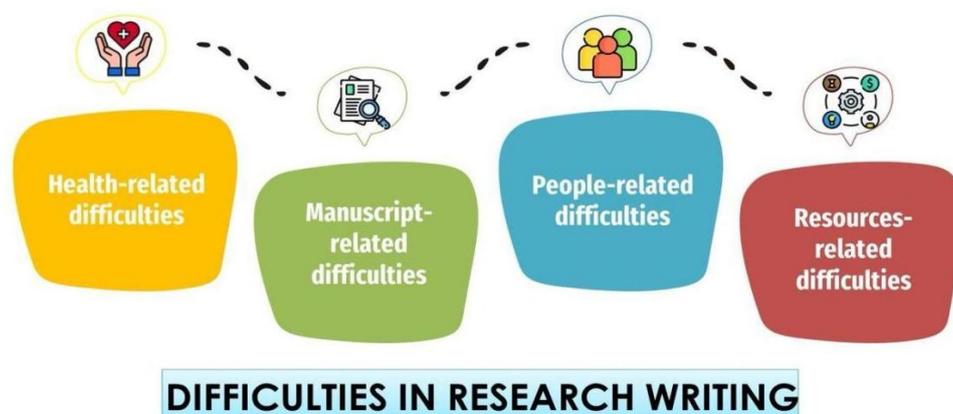

Figure 1. The difficulties in research writing

3.1. Difficulties in research writing

The first dimension in the difficulties faced by senior high school researchers in their research writing is health-related. The subthemes under this construct are physical and psycho-emotional difficulties. When it comes to physical difficulties, students pinpointed that they experienced physical stress which affected their physical health as some students became sick, or some students' underlying illnesses worsened. Under psycho-emotional difficulties, students mentioned that they were mentally and emotionally drained due to pressure and breakdowns. These accounts are consistent with studies showing that student-researchers often experience stress-related symptoms such as anxiety, fatigue, and other health problems during the research process [42], [43]. Thus, it is important to maintain good physical and mental well-being in order to complete the research writing project [44].

The second dimension put forward by the participants is manuscript-related, which includes difficulties in writing the introduction, the methodology, and the results and discussion. Participants admitted that they found it challenging to start their research introduction specifically in crafting their research problems and review of related literature. Yunus *et al.* [45] discussed that problem formulations, research objectives, research gaps, elements that serve as the primary justification for their choice of topic, and review of related literature are considered challenging sections of the introduction, which are consistent with the findings of this study. One participant put forth:

> "*What we really struggled with was creating the research questions making sure that they were related to one another. It took us a very long time in this part of the research.*" (P8)

Students also struggled to write the research methodology. Jilcha [46] revealed a significant number of students face difficulties in research design. Their struggles include selecting suitable methodologies, including the identification of appropriate materials and laboratory procedures, addressing biases in design and data collection, and guaranteeing the reliability and validity of their research. Another problem in the methodology section is choosing research instruments, which is an existing problem in the literature according to Qasem and Zayid [22].

The last manuscript-related difficulty lies in the discussion of the study's results. Students encounter challenges to interpret and describe the research result [47] because writing a research discussion requires an extremely high level of cognitive and metacognitive capabilities [48]. Challenges in research can be explained by cognitive load theory, which explains that difficulties arise when the demands of a task exceed the capacity of an individual's working memory, or their conscious thinking process.

The penultimate dimension in the participants' difficulties in research writing is people-related. Three components such as panel members, advisers, and fellow researchers build up the theme under this dimension. One issue raised by senior high students is the conflict between panel members and advisers. Similar to how teachers play a crucial role in student learning through guidance and coaching [49], advisers and panel members are essential in enhancing research quality by providing constructive feedback which serves as a paramount strategy for improving outcomes [50]. Students mentioned that instructions and suggestions from their advisers were contradicted by panel members or vice versa. This led to confusion among students in writing their research as evidenced by what participant 19 shared.

> "*We missed what the panel members wanted, so we just followed our adviser. When our second defense took place, the panel members and our adviser had different suggestions and directions for what they wanted us to do.*" (P19)

Another key difficulty students faced was the lack of consistent guidance from their advisers, who were unavailable, unclear in their instructions, or delayed in giving feedback. This aligns with the ZPD theory, which posits that proper guidance is crucial for researchers' development. These findings are consistent in the research of Bastola and Hu [13] who stated that students were dissatisfied with their supervisors' poor time management or apparent unwillingness to make time for them, noting that the supervisors' multiple responsibilities often prevented them from providing detailed, in-depth, and constructive feedback. Most supervisors also rarely answer emails or phone messages and hardly offer constructive feedback, as revealed in the study of Shahsavar and Kourepaz [51]. These results highlight how crucial it is for supervisors to give students the necessary direction, modeling, and clarity in order to help them become competent and self-assured in thesis writing [52].

The participants also expressed difficulties with their fellow student-researchers. Their difficulties centered around low-quality outputs and inconsistent participation. According to Ferolino *et al.* [53], research writing is a team effort that requires student-researchers' contribution. In fact, collaboration produced texts that were higher quality and more accurate overall in terms of content, structure, and idea organization [54]. But then, collaboration seemed to be a challenge for some of the participants in this study. Social

constructivism provides a theoretical basis for research collaboration, framing learning as an active process built through social and cultural interactions. This theory stresses that effective learning relies on social interaction and group discussions, which directly supports the need for peer collaboration and teacher guidance in research.

The final dimension in the difficulties faced by senior high school researchers in their research writing is resource-related. It encompasses financial constraints, internet connectivity issues, and laboratory access challenges. Firstly, students reported that financial limitations were a common hurdle, especially due to the frequent need to print and reprint drafts. Research, after all, demands financial fortitude [55]. Consistent with this, students often encounter difficulties acquiring necessary resources during research preparation [56]. As Qiu and Li [57] suggest, scarce financial resources can significantly undermine students' motivation to complete research-related tasks.

Secondly, intermittent internet connectivity compounded these challenges, particularly for students residing in remote areas. Djatmika *et al* [58] highlight how unstable internet connections disrupt online research supervision. Similarly, Tiwari [59] identifies slow or unavailable internet access as another obstacle students face while writing their theses. Finally, students found it difficult to access available laboratories and equipment necessary for their research within their city. P12 remarked:

"*Since our research was about bio-ethanol, we needed laboratory equipment like gas chromatography in one of our parameters. Despite our best effort in finding it in the city, we failed because it was not available.*" (P12)

The findings indicate that a comprehensive approach is essential to assist senior high school researchers. Integrating wellness education, providing stress management workshops, and establishing realistic workloads are essential for addressing health-related challenges and preventing physical and psycho-emotional burnout. Schools may offer focused instruction on formulating research questions, performing literature reviews, mastering methodologies, and interpreting results to address manuscript-related challenges, while also guaranteeing access to academic resources. People-related challenges can be alleviated through enhanced communication and alignment between advisers and panel members, improved training and accessibility for advisers, and the explicit instruction of collaboration and accountability skills to student-researchers. Resource-related constraints necessitate financial literacy training, the exploration of school-funded resources, the assurance of equitable internet access, and the proactive securing or facilitation of access to essential laboratory equipment.

3.2. Difficulties in research presentation

Using a sequential qualitative mixed methods design, the researchers identified two main dimensions of the difficulties faced by senior high school students in their research presentations. These dimensions are classified as inner-directed and outer-directed. Figure 2 illustrates these difficulties.
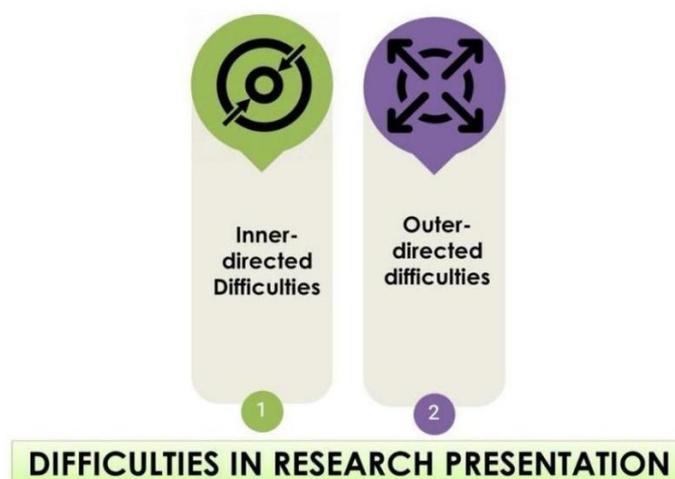

Figure 2. The difficulties in research presentation

3.2.1. Inner-directed difficulties

The foremost dimension regarding the inner-directed difficulties faced by senior high school researchers in their research presentations is encapsulated by their competence and psychological distress. Research-students acknowledged incompetence as a major hurdle. This incompetence is rooted from students' full understanding of their research, their use of the English language, group members who struggled to answer even basic questions during presentations, and inadequate preparation and insufficient mastery of their research. Indeed, there is a need for students to elevate their competence to improve their oral presentation skills [60], [61] because presentation competence is a significant 21st-century skill that students must develop [62]. Furthermore, research show preparation which includes content mastery and practice to be successful in presentations is imperative [63], [64]. This finding is also corroborated by Mardiningrum and Ramadhani [65] who claimed that students' low mastery caused low-quality presentation results. Many researchers pointed out that students experience distress in English language use specifically in speaking publicly [66], [67], caused by worry of negative feedback [68], [69] and specific aspects of the English language such as lexicon and grammar [70].

Another inner-directed difficulty that the students faced during research presentations was psychological distress. It covers anxiety, mental block, pressure, lack of confidence, and organization of thought. This is consistent with the communication apprehension theory, which addresses the feeling of dread or unease about communicating with others. Students reported experiencing intense anxiety or nervousness during presentations. This led to memory lapses, making it difficult for them to recall their prepared material and answer the panel members' questions effectively. This is seen in the following:

> "*Due to nervousness before the presentation, everything that I reviewed or I studied got lost.*" (P51)
> "*It seems that no matter how much I prepare, I can't seem to shake off the feeling of nervousness. This anxiety then leads to self-doubt, making me question whether I can answer their questions effectively...*" (P21)

Anxiety or nervousness is a prevalent obstacle students face when presenting, significantly impacting their performance, especially in front of an audience [71]–[74]. Riyadi *et al.* [75] explained that oral presentation anxiety is predominantly influenced by cognitive factors, including negative thought patterns and insufficient preparation. Furthermore, these are frequently intensified by a propensity to envision worst-case situations and excessively concentrate on negative ideas, resulting in cognitive distortions that amplify stress and impede concentration during presentations.

Mental block is another psychological distress that students experienced in their research presentations. Students claimed that this mental block is also a result of anxiety. Naser and Isa [76] corroborated that anxiety and distress can influence performance negatively. For the researchers in this study, anxiety led them to forget what they had prepared and come out mentally empty during their presentations.

Additionally, students reported experiencing psychological distress manifested in pressure, lack of confidence, and difficulty organizing their thoughts. The pressure associated with presentations was cited as a primary cause, leading to poor performance, diminished confidence, and subsequent challenges in coherent thought processes. One participant acknowledged:

> "*For me, the three main challenges are confidence, mental blocks, and the ability to organize thoughts. Confidence is crucial because not everyone can speak confidently in front of others. When this happens, we lose the ability to deliver our thoughts clearly, which leads to the audience not understanding what we're saying.*" (P15)

Previous research concluded that self-confidence greatly affects students' speaking skills [77], [78] like pronunciation [79] and academic performance [80] as a whole. Moneva and Tribunalo [81] argued that a higher level of self-confidence resulted in faster and better performance while a lower confidence level resulted in less participation and lower performance. Thus, students need proper and consistent guidance to boost their self-confidence [82]. In organizing thoughts, Vicente [83] argued that the process of converting thoughts into words is quite complicated. Frankfort [84] defended that the true meaning of something said only happens when it is actually said. This difficulty of organizing thoughts during public speaking or oral presentation was also observed in students from South Korea [85]. Finally, these difficulties in presentation can be further supported by self-determination theory which states that motivation and well-being are driven by meeting three core psychological needs: relatedness, competence, and autonomy.

3.2.2. Outer-directed difficulties

The second dimension of the students' difficulty in research presentation is outer-directed. This dimension includes time constraints and the nature of questions thrown at them by the panel members during their research presentations. While preparing for the oral presentations, students had to operate at a limited time. Due to time constraints, students struggled to master their presentation content and collaborate effectively for a cohesive and synchronized delivery. According to Razali et al. [86], students frequently cite insufficient time as a barrier to completing academic tasks. While time constraints are indeed a challenge in preparing for research presentations, students often struggle with time management. Balancing academic demands with daily life can be difficult [86], [87]. Procrastination, ineffective prioritization, and a lack of planning contribute significantly to poor time management among students [88].

Another challenge that the researchers faced was the nature of the questions posed by the panel members during their presentations. According to the students, these questions significantly impacted their performance. The questions were either too difficult to comprehend or unrelated to the study. The panel members' divergent, often contradictory viewpoints significantly influenced the questions posed.

According to Shen et al. [89], students' abilities to answer questions vary based on difficulty level, with some students demonstrating quicker cognitive processing than others. Anaya et al. [90] relate this disparity of processing of questions to previous knowledge and entry level of students. Thus, it is important that questions' level of difficulty is to be considered as it can greatly affect the performance of students [91].

The findings of this study carry important implications for both educational practice and policy. Inner-directed challenges, such as research incompetence, limited English language proficiency, and psychological distress, highlight the need for targeted interventions. These may include workshops on anxiety management, specialized language support, and explicit instruction on structuring presentations. At the policy level, there is a clear need to integrate public speaking and psychological coping strategies into the curriculum, along with accessible student support services. To address outer-directed challenges such as time constraints, educators can implement structured timelines, rehearsal schedules, and scaffolded tasks to help students manage their time more efficiently. Meanwhile, practical measures should include the development of standardized protocols for panel members, enhanced coordination between advisers and panels, and improved feedback mechanisms. Policies should also promote collaboration and consistent assessment practices to create a more supportive academic environment.

4. CONCLUSION

This sequential qualitative mixed-methods study paved the way for the dimensions of the difficulties faced by senior high school researchers in their research writing and research presentations. The dimensions in their research writing are related to health, manuscript, people, and resources, whereas the dimensions in their research presentations are inner-directed and outer-directed. Research teaching and advising require conscientious dedication, content knowledge, and pedagogical competence. In this regard, there is a need for training to capacitate senior high school research teachers on the current trends and best practices in research pedagogy and research supervision with the objectives of applying these trends and practices in teaching research and to develop their expertise in the diagnosis of research manuscripts. Addressing the identified research writing and presentation difficulties in this study could improve the general capabilities and performance of senior high school students thereby contributing to the realization of United Nations sustainable development goal 4.5 on equal access to all levels of education and 4.7 on ensuring that all learners acquire the knowledge and skills needed to promote sustainable development through global citizenship.

Just like any research, limitations can be found in this study. Hence, the following recommendations could be considered. First, the research is a combination of qualitative methods which inherently means that generalizing the findings to other contexts needs to be taken with caution. Second, a questionnaire could be crafted incorporating the dimensions of the difficulties faced by senior high school researchers in their research writing and research presentations. Third, other researchers could utilize a sequential mixed-methods design using the newly-crafted questionnaire as the instrument in the collection of the quantitative data and a series of interviews in the collection of qualitative data to dig deeper in the extreme results. Lastly, this research only focused on the experiences of senior high school students which is why it is worth investigating research teachers' perspectives and experiences in teaching practical research 1 and 2.

AUTHOR CONTRIBUTIONS STATEMENT
        This journal uses the Contributor Roles Taxonomy (CRediT) to recognize individual author contributions, reduce authorship disputes, and facilitate collaboration.

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C : **C**onceptualization	I : **I**nvestigation	Vi : **Vi**sualization
M : **M**ethodology	R : **R**esources	Su : **Su**pervision
So : **So**ftware	D : **D**ata Curation	P : **P**roject administration
Va : **Va**lidation	O : Writing - **O**riginal Draft	Fu : **Fu**nding acquisition
Fo : **Fo**rmal analysis	E : Writing - Review & **E**diting	

CONFLICT OF INTEREST STATEMENT
        Authors state no conflict of interest.

INFORMED CONSENT
        We have obtained informed consent from all individuals included in this study.

DATA AVAILABILITY
        The data that supports the findings of this study are available on request from the corresponding author, [ISM]. The data, which contain information that could compromise the privacy of research participants, is not publicly available due to certain restrictions.

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