Ideal research adviser: senior high school students' post-research perspectives

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Article Info	ABSTRACT
	Research advisers play a vital role in guiding senior high school students through their research projects, which are essential for developing critical thinking, problem-solving, and communication skills. This study explores the attributes that students who have completed their research projects consider essential for an ideal research adviser. Employing a qualitative phenomenological approach, semi-structured interviews were conducted with nine students from a private school in Northern Philippines. Braun and Clarke's thematic analysis was used to analyze the data. The findings reveal four key themes: expertise and guidance, support and encouragement, open communication and collaboration, and fostering independence and critical thinking. These results highlight the significance of research advisers in providing both technical expertise and emotional support, which are crucial for creating a collaborative environment that promotes student autonomy. This study addresses a notable gap in the literature, offering valuable insights into high school students' specific needs in research mentorship. Educational institutions can utilize these findings to enhance the training and effectiveness of research advisers, ultimately improving the research experience and outcomes for students.

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1. INTRODUCTION

Integrating empirical research into senior high school education fosters critical thinking, problem-solving, and communication skills [1]–[3]. However, the research process can overwhelm high school students, who lack expertise and experience [4]. Research advisers guide students through the process, providing support, guidance, and feedback [5]. They empower students to refine their research abilities and craft high-quality projects [6]. By bridging the gap between theoretical knowledge and practical application, advisers enable students to explore real-world problems and reach their full potential [7]. To cultivate effective mentorship, we must identify the attributes and expertise that define an ideal research adviser. This will allow us to empower high school students to excel as researchers, not just complete projects.

Despite frameworks promoting inquiry-based learning, senior high school research faces challenges like inadequate resources and training [8] and the digital divide [9], impacting research advisers' effectiveness. Pedagogical ideals of critical thinking, problem-solving, and communication skills clash with under-resourced schools and diverse needs. Ethical complexities in school research require sophisticated, contextualized approaches beyond traditional methodologies [10]. High school students need consistent access to competent advisers to navigate these unique obstacles.

Research advisers shape their advisees' research trajectories, providing valuable guidance on requirements, topic selection, and methodology development, which significantly impacts academic outcomes [11], [12]. They also offer emotional support and psychosocial guidance, essential for navigating research intricacies, especially for early-career researchers [13]. Effective advisers cultivate a supportive environment, indispensable for completing projects. The adviser-advisee relationship determines the quality and impact of research outputs, profoundly shaping students' academic and career trajectories beyond the immediate research endeavor.

The research adviser-student bond is crucial, influencing students' academic and career paths [14], [15]. A strong, supportive relationship helps students' complete projects on time [16], [17] and pursue advanced degrees or research careers [18], [19]. This relationship fosters a sense of belonging, enhances research self-efficacy, and fuels academic aspirations, leading to scholarly productivity and timely research completion [15]. Effective advisers create inclusive environments that nurture students' sense of belonging, self-efficacy, and academic achievement [20], [21]. Recognizing the long-term impact on students' personal and professional lives highlights the significance of this relationship in shaping the next generation of scholars and researchers.

The significance of effective research advisers is further underscored by the effectiveness of group advising in promoting student success and retention, particularly in graduate programs [22]. While most research has focused on graduate education, available evidence suggests that positive advising experiences also have a significant impact on international doctoral students [5], [23]. This underscores the importance for research advisers to be culturally sensitive and aware of the unique challenges faced by these students. Research advisers with the right qualities can play a pivotal role in dismantling the structural barriers that have historically hindered underrepresented groups in science, technology, engineering, and mathematics (STEM) fields [24], [25], emphasizing the need to identify these key qualities and attributes. By recognizing and valuing the diverse experiences and backgrounds of students, research advisers can help foster a more inclusive and supportive academic community, ultimately leading to increased student success and retention.

Although prior studies have explored various aspects of the adviser-advisee relationship [11], [22], [26] and advisee satisfaction [5], [27], gaps remain in understanding the specific attributes senior high school students seek in an ideal research adviser. Existing literature predominantly focuses on graduate students' experiences [14], [28], [29], which may differ significantly from those of high school students due to academic level, project scope, and relationship dynamics. Furthermore, most studies rely on survey data [20], [30], or examine the adviser's role from a faculty perspective [31], potentially overlooking the nuanced details of students' personal accounts. Therefore, more qualitative, student-centered research is needed to capture the voices and experiences of high school students who have completed research projects under adviser guidance. This approach can provide valuable insights to improve the preparation and support for research advisers, helping them better meet high school students' unique needs and expectations. Thus, the overarching research question we aim to address is: what attributes do senior high school students who have completed their research consider essential for an ideal research adviser?

2. METHOD

This study employed a qualitative phenomenological method to investigate the attributes senior high school students consider essential for an ideal research adviser. This approach aims to understand and describe individuals' lived experiences regarding a specific phenomenon [32]. It allows researchers to deeply explore participants' subjective experiences and the meanings they attribute to them [33]. Nine senior high school students from a private school in Northern Philippines participated in the study. Adhering to phenomenological research guidelines, which recommend a sample size of 6 to 10 to ensure data richness and manageability [34], the participants were chosen using purposive sampling. This method ensured that the selected individuals were particularly knowledgeable about the research subject and met the study's specific needs, thereby enhancing the study's rigor and trustworthiness [35]. The criteria for selection included having completed research projects under a research adviser's guidance and being enrolled in one of the following academic tracks, with three representatives from each: humanities and social sciences (HUMSS), STEM, and accountancy, business, and management (ABM).

Data were collected using semi-structured interviews, ideal for phenomenological research due to their flexibility in probing participants' experiences while staying focused on the research question [36]. The interview questions were based on the main research question and validated by three educational experts. Each interview was audio-recorded and transcribed verbatim with participants' consent. Participants were informed about the study's purpose and their rights, including anonymity, voluntary participation, and the ability to withdraw without repercussions. Table 1 displays the interview questions that were posed to the study's participants.

Table 1. Interview schedule for the participants

Type of question	Sample interview question
Introduction	Can you briefly share your research experience in senior high school?
Transitory	How do you define a good research adviser?
	Can you recall any moments or experiences that stood out to you during your research project?
Body/core	What qualities or attributes do you think an ideal research adviser should possess?
	Can you describe a situation where your research adviser supported you in a way that was particularly helpful?
	What was the most helpful thing your research adviser did to assist you with your research project?
	Were there any attributes or qualities that your research adviser lacked, but you felt would have been helpful?
Closure	How can a research adviser best support students' research while also giving them independence?
	Is there anything else you'd like to share about your experience with research advisers or any advice for future research students?

Data analysis employed Braun and Clarke's [37] thematic analysis, which involves six steps: familiarizing with the data, generating initial codes, identifying themes, reviewing themes, defining and naming themes, and producing the report. This method ensures a thorough examination of qualitative data. It allows for the identification of key themes that capture the essence of participants' experiences.

3. RESULTS AND DISCUSSION

This study explored the specific attributes that senior high school students value in an ideal research adviser, addressing gaps left by extensive research on the adviser-advisee relationship and advisee satisfaction. While previous studies have focused largely on graduate students, they have overlooked the unique perspectives and needs of high school students. Furthermore, these studies predominantly used survey data or examined the adviser's role from a faculty perspective, failing to capture the detailed personal experiences and preferences of students.

To fill this gap, the study identified four main themes that senior high school students consider essential for an ideal research adviser: i) expertise and guidance; ii) support and encouragement; iii) open communication and collaboration; and iv) independence and critical thinking catalyst. These findings underscore the multifaceted role of research advisers in providing both technical and emotional support to their students. The results suggest that a comprehensive approach to research advisory, incorporating these key attributes, can significantly enhance students' research experiences and outcomes. The categories below yield these themes, illustrated in Figure 1.

Figure 1. Senior high school students ideal research adviser

3.1. Expertise and guidance

This theme revolves around the adviser's proficiency in guiding students through the research process, which is rooted in their deep understanding of the research field. An ideal research adviser, as perceived by senior high school students, should possess the knowledge and ability to provide expert guidance, ensuring students receive the necessary support to successfully complete their research projects. To better illustrate the theme, Table 2 presents a selection of participant quotes alongside the corresponding codes derived from their responses.

Table 2. Expertise and guidance

Code	Excerpt
Expertise	*"For me, a great adviser is like a good coach. She shares her expertise and guides you, but she also knows when to step back and let you take charge–because that's how you really learn and grow as a researcher."* [Participant 1]
Clear guidance	*"A good adviser needs to be a clear communicator, of course, especially when it comes to research techniques. But beyond that, it's about giving guidance that's understandable and constructive, feedback that actually helps you improve."* [Participant 3]
Constructive feedback	*"My adviser gives really great feedback–honest and constructive. He doesn't sugarcoat things, but it's clear he wants to help me improve and produce my best work, which is really motivating."* [Participant 4]
Resourceful	*"I really appreciated how resourceful our adviser was. One instance that comes to mind is when she went out of her way to help us find extra articles and journals to strengthen our manuscript. That willingness to go the extra mile was really impressive."* [Participant 2]
Technical hands-on	*"He wasn't just giving us feedback from a distance; he was incredibly hands-on. For example, he'd really dig into our research paper, making sure our sources were solid and catching any missing citations. That technical guidance, that dedication to combing through every detail, was really appreciated."* [Participant 5]

The theme "expertise and guidance" highlights the essential role of a research adviser's extensive knowledge and mentoring proficiency. High school seniors highly value an adviser's expertise, which fosters trust and confidence in the educational process. Clear expectations and actionable feedback are critical for students to efficiently navigate their research projects [38], [39]. Resourceful advisers who connect students with pertinent resources and opportunities significantly enrich the learning experience, emphasizing the importance of access to professional networks [40]. Additionally, advisers' active involvement in the technical aspects of research is crucial for experiential learning, facilitating essential skill acquisition and application [39]. These practices suggest that students who receive effective guidance and have access to resources perform better and develop vital research skills. To support this, continuous professional development for advisers, institutional support for communication training, and enhanced access to resources and networks are recommended [41]. Implementing formal feedback mechanisms ensures that mentoring is tailored to meet each student's unique needs, thereby improving the overall mentoring experience.

3.2. Support and encouragement

This theme emphasizes the adviser's role in providing emotional and motivational support to students, transcending beyond mere technical guidance. An ideal research adviser, as perceived by senior high school students, should foster a supportive environment that empowers students to navigate the challenges of research, builds their confidence, and inspires them to excel. Table 3 provides a clear picture of the research findings by showcasing the identified codes within the theme, supported by direct quotes from the study's participants.

Table 3. Support and encouragement

Code	Excerpt
Supportive	*"She was really supportive, especially during stressful deadlines. She always believed in us and gave practical advice, keeping us on track and suggesting new approaches when needed."* [Participant 8]
Encouraging	*"Great advisers excel at providing support and encouragement, balancing constructive feedback with recognition of successes to build confidence for independent work."* [Participant 7]
Understanding	*"Obviously, research expertise is key, but for me, the most important quality is that they're understanding. A good adviser takes the time to really listen, offering guidance without being judgmental. They create a positive environment where you feel comfortable asking questions, sharing ideas, and even making mistakes as you learn."* [Participant 9]
Patient	*"I think patience is critical for a research adviser. Taking the time to clearly explain complex concepts and being supportive of students who learn at different paces really makes a difference."* [Participant 4]
Boosts morale	*"A good adviser is like a compass and a cheerleader in one guiding you every step of the way while keeping your spirits high, especially when research gets tough."* [Participant 6]

The theme "support and encouragement" emphasizes the essential role of research advisers in providing emotional and motivational support to students. High school students highly value advisers who genuinely care about their well-being and progress, thereby fostering a positive and trusting research environment [42]. Advisers who motivate and inspire students to persevere and excel significantly enhance student engagement and enthusiasm [43]. Empathy and patience are crucial, as they help students feel supported and allow them to develop at their own pace, reducing pressure and facilitating effective learning [44], [45]. By instilling confidence and maintaining a positive attitude towards research, advisers boost students' morale and overall research experience [46]. To implement these practices, institutions should provide training programs for advisers on emotional intelligence and motivational techniques, establish

regular feedback mechanisms, and offer resources to help advisers effectively address students' needs. These measures ensure advisers can effectively support and encourage their students, leading to improved academic and research outcomes.

3.3. Open communication and collaboration

This theme highlights the significance of a collaborative and communicative environment in the research adviser-student relationship. An ideal research adviser, as perceived by senior high school students, should facilitate open and effective communication, fostering a sense of teamwork and mutual respect. Table 4 presents the theme's codes and participant quotes, illustrating the findings.

Table 4. Open communication and collaboration

Code	Excerpt
Effective communicator	*"An ideal research adviser should possess expertise in their field, excellent communication skills, adaptability, and a passion for research."* [Participant 6]
Open communicator	*"I think that research advisers can achieve this by providing clear expectations and suggestions, offering regular feedback sessions with open communication, and encouraging students to take initiative in problem-solving and decision-making within the project's scope."* [Participant 1]
Collaborative	*"My adviser is amazing at fostering a true team spirit among our research group. We all feel like we're working together towards a common goal, which not only makes the work more enjoyable, but also leads to a much stronger finished product."* [Participant 2]
Accessible	*"When I'm feeling stressed about meeting our paper's deadlines, our research adviser is always there to lend a listening ear and offer words of encouragement. He's incredibly accessible and provides advance updates, motivational support, and even shares his expertise to help us overcome obstacles."* [Participant 5]
Regular check-ins	*"My adviser is fantastic about checking in regularly, and not just about the research itself. She genuinely cares about how we're doing overall and is always there to offer support, which makes a big difference."* [Participant 7]

The theme "open communication and collaboration" underscores the critical importance of effective communication and teamwork between research advisers and students. Senior high school students highly value advisers who communicate information clearly and actively listen, creating an environment where students feel comfortable sharing ideas and asking questions [40], [47]. Collaborative approaches that prioritize student input and ensure adviser accessibility and availability are essential for successful research outcomes [48], [49]. Regular check-ins are crucial for monitoring progress and providing timely assistance, thereby enhancing the overall research experience [50]. These practices establish a supportive research environment that boosts student confidence and engagement. To support these approaches, institutions should offer training for advisers in communication and collaboration skills and implement policies that encourage open communication channels and regular feedback sessions. These measures ensure continuous support, timely issue resolution, and smoother research progress.

3.4. Independence and critical thinking catalyst

This theme focuses on the adviser's role in fostering students' independence and critical thinking skills, enabling them to develop into self-sufficient researchers. An ideal research adviser, as perceived by senior high school students, should create an environment that encourages students to think critically, make informed decisions, and take ownership of their research projects. The results, including thematic codes and participant quotes, are illustrated in Table 5.

Table 5. Independence and critical thinking catalyst

Code	Excerpt
Promotes independence	*"A research adviser should be knowledgeable, approachable, innovative, open-minded, and most importantly, someone who can let their students discover and learn on their own."* [Participant 4]
Critical thinker	*"My adviser's passion for research is contagious! He always brings a rigorous analytical approach to his work, and it really motivates me to push myself harder and strive for that same level of excellence."* [Participant 6]
Delegation and trust	*"A good adviser balances guidance with giving students ownership over their research. This trust, along with clear delegation and support, allows for real learning and growth."* [Participant 2]
Encourage initiative	*"My adviser really encourages us to take ownership of our own research. She provides clear expectations and consistent feedback, of course, but she also gives us the space to think independently, solve problems, and develop the confidence we need to become capable researchers."* [Participant 1]
Values student input	*"I think the key is for research advisers to create a truly collaborative environment, one that really values student input. Of course, providing clear expectations and suggestions from the start is important to keep everyone on track."* [Participant 9]

The theme "independence and critical thinking catalyst" focuses the adviser's role in fostering student autonomy and intellectual development. Advisers empower students to become independent researchers by encouraging ownership of their research, which enhances problem-solving skills and self-reliance [51]. Challenging students to think critically and generate their own ideas drives intellectual growth and innovation [52]. Effective delegation and trust build confidence and accountability, enabling students to take responsibility for their tasks [53]. Additionally, motivating students to explore different approaches and take initiative promotes creativity and proactive learning [54]. By respecting and valuing students' perspectives, advisers create an engaging and supportive research environment. These practices help students develop essential research skills, preparing them for future academic and professional challenges. Institutions should support advisers with training programs focused on fostering independence and critical thinking and implement structured mentoring programs. Regular feedback sessions are crucial for continuous improvement in mentoring practices and addressing student concerns promptly.

4. CONCLUSION

High-quality research advisorship is crucial for senior high school students embarking on scientific research. Understanding the key qualities that make a research adviser effective during this stage is essential for student success and fostering a lifelong passion for scientific inquiry. This study thoroughly examines this critical area by investigating the attributes that senior high school students value in an ideal research adviser.

The findings are based on four main themes that define an ideal research adviser: expertise and guidance, support and encouragement, open communication and collaboration, and fostering independence and critical thinking. These themes highlight the need for a comprehensive approach to research advisorship, encompassing both technical guidance and emotional and motivational support. The study's results have significant implications for research adviser training programs, emphasizing the development of essential qualities such as expertise, support, open communication, and fostering independence. By understanding the attributes of an ideal research adviser, educational institutions can implement targeted interventions to assist research students, ultimately enhancing research productivity and academic achievement. This, in turn, can lead to improved research outcomes and greater student satisfaction.

Future studies could examine the effectiveness of research adviser training programs in cultivating these identified attributes and assess their impact on research outcomes and student satisfaction. Longitudinal studies might investigate the long-term effects of ideal research advisorship on students' research careers and academic achievement. Additionally, further research could explore the generalizability of these findings across different educational contexts and disciplines, considering potential cultural and disciplinary variations in the attributes of an ideal research adviser.

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	: Conceptualization	I	: Investigation	Vi	: Visualization
M	: Methodology	R	: Resources	Su	: Supervision
So	: Software	D	: Data Curation	P	: Project administration
Va	: Validation	O	: Writing - Original Draft	Fu	: Funding acquisition
Fo	: Formal analysis	E	: Writing - Review & Editing		

CONFLICT OF INTEREST STATEMENT
Authors state no conflict of interest.

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

ETHICAL APPROVAL
We ensured that all researches conducted respected participant confidentiality, adhered to ethical guidelines, and contributed to the academic community with honesty and integrity.

DATA AVAILABILITY
The data that support the findings of this study are available from the corresponding author, [NLT], upon reasonable request.

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