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From classroom learning to real-world skills: an autoethnographic account of school field trips and STEM work immersion program management

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Abstract
Quality science education is crucial in preparing students for real-world challenges by fostering scientific literacy and critical thinking skills. Field trips and work immersion programs support this goal by providing hands-on experiences and real-world applications of scientific concepts, thereby enhancing student engagement and understanding. This autoethnographic study explores the management of school field trips and work immersion programs, emphasising their impact on student engagement and learning outcomes. Through personal experiences and reflective practices, I examine the logistical planning, risk management, and curriculum alignment necessary for successful implementation. The findings highlight how these programs enhance students' understanding of scientific principles, foster critical thinking, and encourage STEM career interests. Key strategies include collaborative planning, flexibility, and ongoing evaluation, providing insights into optimising educational programs and bridging the gap between classroom learning and real-world application.

Keywords Autoethnography research, Experiential learning, Field trips, Science education management, STEM education, Work immersion program

Introduction

Science education plays a crucial role in preparing students for the complexities of the real world, equipping them with critical thinking skills and scientific literacy essential for informed decision-making and problem-solving (Acut, 2022; Acut & Antonio, 2023; Herman et al., 2019). Experiential learning, a cornerstone of contemporary educational practice, emphasizes the importance of bridging classroom instruction with real-world experiences (Kong, 2021). School field trips and work immersion programs are pivotal in providing students with such opportunities, enriching their learning by situating knowledge within practical, real-world contexts (Acut et al., 2021; Sánchez-Fuster et al., 2023). These experiences not only deepen understanding but also foster skills essential for success beyond the classroom, including collaboration, adaptability, and the application of scientific principles in diverse settings (Schneiderhan-Opel & Bogner, 2021).

Field trips have long been lauded for enhancing student learning through tangible, hands-on experiences that can ignite interest and deepen understanding across various subjects (DeWitt & Storksdieck, 2008). Similarly,

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work immersion programs allow students to engage with professional environments, fostering the development of practical skills and career readiness (Luk & Chan, 2024). Both educational strategies align with Kolb's (1984) experiential learning theory, which posits that learning is most effective when it involves a cyclical process of concrete experiences, reflective observation, abstract conceptualization, and active experimentation (Watson et al., 2019).

However, while much research has examined the student outcomes of these experiential learning strategies, there is a notable gap in the literature regarding the challenges and complexities that educators face in managing and facilitating these programs. To address this gap, an autoethnographic research design is particularly well-suited. Autoethnography allows for an in-depth exploration of the personal experiences of educators, offering unique insights into the management and organizational aspects of school field trips and work immersion programs that are often overlooked in traditional research (Ellis et al., 2011; Poulos, 2021).

As an educator deeply involved in managing these initiatives, I am positioned to provide a reflective, first-person account of the processes, challenges, and decision-making that occur behind the scenes. Autoethnography enables the blending of personal narrative with broader cultural, pedagogical, and institutional analysis, providing a holistic understanding of how these programs operate and the impact they have on both students and educators. Through this method, I can critically examine my experiences, not just as an observer or researcher, but as an active participant, offering rich, contextualized insights that are vital to understanding the full scope of experiential learning in science education. This approach is particularly appropriate for answering the research question, as it prioritizes lived experience and reflective practice, both of which are central to understanding the management of such educational programs (Wall, 2006).

Literature review

Experiential learning, authenticity, and educational outcomes

Experiential learning is widely recognized as a vital pedagogical approach in science education, bridging the gap between theoretical knowledge and practical application. It fosters deeper student engagement, critical thinking, and the ability to apply scientific concepts in real-world contexts. Kolb's (1984) experiential learning theory underpins much of this practice, emphasizing a learning cycle of concrete experience, reflective observation, abstract conceptualization, and active experimentation. As Kolb (2015) later reiterated, these hands-on learning opportunities are essential for solidifying abstract scientific concepts, particularly in complex STEM fields (Kingkaew et al., 2023; Watson et al., 2019).

Several studies have documented the positive effects of experiential learning on student outcomes, including academic achievement, increased motivation, and enhanced problem-solving skills (Muzaffar et al., 2020; Tembrevilla et al., 2023). Field trips, for example, have been shown to significantly improve students' understanding of scientific concepts by situating learning in real-world environments, which promotes a more holistic understanding (Morag & Tal, 2012). Similarly, work immersion programs provide students with first-hand exposure to professional STEM practices, bridging academic knowledge with career readiness (Drymiotou et al., 2021; Gamale et al., 2021). Research by Ismail and Yusof (2023) further highlights the importance of such experiences in fostering interest in STEM careers and shaping students' career trajectories.

However, while the benefits for students are well documented, there is limited exploration of the role and experiences of educators in managing these programs. The existing literature predominantly focuses on the outcomes for students, often overlooking the significant managerial, logistical, and emotional labour involved in planning, executing, and reflecting on these experiences from the educator's perspective. This presents a significant gap in the research, one that this autoethnographic study aims to address.

Program management and implementation

The successful implementation of experiential learning programs, such as school field trips and work immersion initiatives, is contingent on effective program management (Wang et al., 2022). Educators must balance multiple responsibilities, including aligning activities with curriculum goals, ensuring student safety, managing logistics, and coordinating with external stakeholders (DeWitt & Storksdieck, 2008; Penman et al., 2023). Despite the educational value these programs provide, their management is complex and often requires navigating bureaucratic, institutional, and financial challenges (Almaleh et al., 2019). Research has shown that logistical factors—such as transportation, scheduling, budgeting, and risk management—pose significant hurdles for educators tasked with organizing these experiences (Zegwaard et al., 2020; Fleming & Hay, 2021). Educators must perform meticulous planning to ensure that these activities are safe, affordable, and aligned with learning outcomes (Molele et al., 2024; Yoon et al., 2016). Wythe (2023) notes that risk management, in particular, is a crucial element that demands comprehensive preparation, including risk assessments, safety protocols, and contingency planning to mitigate potential hazards.

While logistical challenges are well-documented, fewer studies have explored the emotional and professional toll these responsibilities take on educators, who must often manage these programs alongside their regular teaching duties. This underexplored facet of experiential learning management points to a need for research that centers on the educator's experience, particularly the challenges and complexities they encounter in managing such programs.

Educators' roles in experiential learning: a missing perspective

The vast majority of literature on experiential learning focuses on its impact on student outcomes, with little attention paid to the educator's perspective. Studies that do examine the educator's role tend to emphasize logistical planning (DeWitt & Storksdieck, 2008; Nguyen, 2022), but there is limited research on the personal, reflective, and professional experiences of teachers who manage these programs. While Molele et al. (2024) and Zegwaard et al. (2020) briefly discuss the importance of educator involvement in ensuring successful experiential learning, they stop short of examining the intricacies of program management from the teacher's point of view.

This gap in the literature is critical, as educators not only facilitate student learning but also navigate the complexities of managing resources, coordinating with community partners, and addressing administrative constraints. Educators' experiences and perspectives are crucial to understanding the full impact of experiential learning programs, yet they remain underrepresented in research. Furthermore, studies that adopt an ethnographic or reflective approach to understanding the role of educators in these programs are scarce, despite the clear need for such insights (Fleming & Hay, 2021).

The need for autoethnographic inquiry

Given this gap, there is a compelling need for research that delves into the managerial and logistical aspects of experiential learning from the perspective of educators. Autoethnography, as a research method, is particularly suited to this inquiry because it allows for a reflective and personal exploration of the researcher's lived experience, capturing both the internal and external challenges faced by educators in organizing and managing these programs. As noted by Pańkowska (2022), autoethnography provides a platform for integrating personal narrative with broader cultural and institutional analysis, making it an ideal method for examining the nuanced role of educators in experiential learning.

Hence, this study draws on my extensive experience in managing school field trips and work immersion programs to illuminate the multifaceted challenges and rewards associated with these endeavours. Key research questions that guided this study were: (1) How do school field trips and work immersion programs enhance student engagement and learning outcomes in science education? (2) What are the key logistical and risk management challenges encountered in the planning and execution of school field trips and work immersion programs, and how can these challenges be effectively addressed? (3) What effective strategies and areas for improvement can be identified from the author's experiences in managing these programs to optimise their educational impact?

Methods

Research design

This study adopted an autoethnographic research design to explore the multifaceted experiences of managing school field trips and work immersion programs in science education. Autoethnography, as a qualitative research method, is a form of autobiographical academic writing that delves into the author's lived experiences (Poulos, 2021). This method enabled me to use personal experiences as a primary source of data to investigate broader cultural, social, and educational phenomena (Ellis et al., 2011). By situating my experiences within the larger educational context, this approach provided rich, nuanced insights into the practical realities, challenges, and benefits associated with these experiential learning programs (Goodall, 2001). Using an analytical/interpretative approach, I aimed to provide a detailed account of my experiences, which enabled a critical examination of the interplay between my actions and systemic factors. This approach offered insights that were both deeply personal and broadly applicable (Ellis, 2004; Ellis & Adams, 2014).

Data sources and collection

The primary data sources for this autoethnographic study included personal narratives, reflective journals, and field notes accumulated over years of managing school field trips and work immersion programs (Fig. 1). These data sources captured a wide range of experiences, from the initial planning stages to the execution and post-activity reflections. Additionally, relevant documents such as program outlines, risk management plans, student feedback forms, and correspondence with stakeholders were reviewed to complement the personal narratives (Fig. 2).

Data collection involved a systematic review of these materials to identify significant events, decisions, and reflections related to the research questions. I revisited my journals and field notes to extract detailed descriptions of key experiences, focusing on moments that highlighted the challenges and rewards of managing these programs. This process allowed for a comprehensive understanding of the practical and educational aspects of field trips and work immersion programs.

Fig. 1 Comprehensive field and laboratory experiences of students. Experiential-learning documentation, to wit: **A** Students setting up a quadrat to assess both abiotic and biotic components in the study area; **B** Students actively collecting water samples for environmental analysis; **C** Weather monitoring instruments in use at the national weather bureau for accurate weather data collection; **D** Seismic expert demonstrating the use of an earthquake detection kit for earthquake monitoring and preparedness; **E** Work immersion student engaged in hands-on experience with electronic components and assembly; **F** Immersion students attending a lecture on spectrometry at a state-owned agriculture laboratory; **G** Immersion students working on the analysis of organic matter and soil samples for agricultural research; and **H** Immersion students conducting quantitative soil analysis experiments to evaluate agricultural soil samples

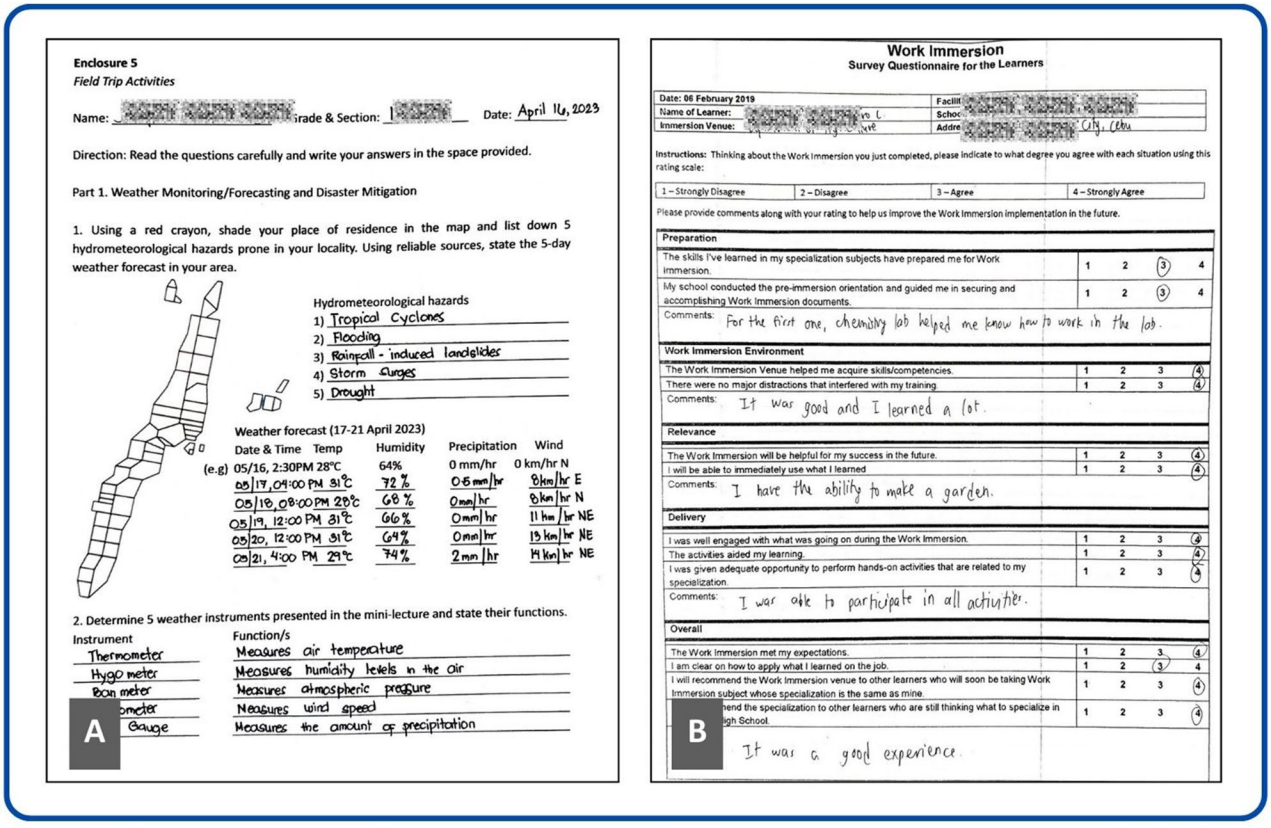

Fig. 2 Documented evidence as data sources. Data sources proof, to wit: **A** Scanned proof of student-completed activity sheet during the field trip; and **B** Scanned proof of survey questionnaire responses from learners during the immersion program

Trustworthiness, reflexivity, and limitations

Ensuring the trustworthiness of an autoethnographic study involved several strategies. To enhance credibility, I engaged in member checking by sharing my narratives and interpretations with colleagues who had also been involved in these programs (Sparkes, 2024; Hughes et al., 2012). Their feedback helped validate the accuracy of my accounts and provided additional perspectives. Triangulation was employed by comparing personal narratives with other data sources, such as student feedback and official documents, to ensure consistency and depth in the findings (Eitzel, 2023).

Reflexivity was a critical component of this study, requiring ongoing self-awareness and critical reflection on my role as both researcher and participant (Koopman et al., 2020). I maintained a reflexive journal to document my thoughts, emotions, and potential biases throughout the research process. This practice helped me remain conscious of how my experiences and perspectives shaped the study and ensured a transparent and reflective approach.

Acknowledging the limitations of autoethnography was also important (Ellis et al., 2011; Méndez, 2014). The subjective nature of personal narratives meant that the findings might not be generalizable to all educational contexts. However, the value of this study lay in its detailed, context-rich insights that could inform practice and policy in similar settings. Additionally, my dual role as researcher and participant might have introduced bias, but reflexive practices and member checking mitigated this risk (Koopman et al., 2020; Eitzel, 2023).

Data analysis approach

Data analysis in this autoethnographic study involved thematic analysis to identify and interpret patterns and themes within the personal narratives and supplementary data sources (Braun & Clarke, 2012 as cited in Leung, 2021). The analysis was guided by the main research questions, focusing on how field trips and work immersion programs enhanced student engagement and learning outcomes, the logistical and risk management challenges encountered, and the effective strategies and areas for improvement.

The first step in the analysis was coding the data, which involved systematically categorising significant pieces of information that related to the research questions. Initial codes were generated based on recurring topics and key experiences. These codes were then grouped into broader themes that captured the essence of the data. Next, I engaged in narrative analysis to construct

detailed, cohesive accounts of specific events and experiences. This approach helped illuminate the connections between individual actions and systemic factors, providing a deeper understanding of the interplay between personal experiences and the broader educational context. Throughout the analysis, I employed constant comparison techniques to refine and validate the emerging themes. This iterative process involved continuously comparing new data with existing codes and themes to ensure consistency and comprehensiveness. The final themes were synthesised to answer the research questions, offering insights that were both personal and broadly relevant to the field of science education.

Lastly, Ellis et al. (2011) emphasise that while autoethnography centres on personal experiences, it also aims to connect these experiences with broader cultural, social, and educational contexts. Thus, I have developed a visual framework to effectively illustrate these connections, demonstrating how individual experiences relate to larger systemic factors. Employing these methodological strategies, the study offered a rich, reflective account of the complexities involved in managing school field trips and work immersion programs, contributing valuable knowledge to the field of experiential learning in science education.

Results and discussion

RQ1 How do school field trips and work immersion programs enhance student engagement and learning outcomes in science education?

Promoting active learning and engagement

During my experience as an educator, I consistently observed that my students reported heightened engagement during field trips and work immersion activities compared to traditional classroom settings. This engagement stemmed from the hands-on nature of these activities, which allowed students to interact directly with scientific phenomena. For example, when I organised a visit to a weather forecasting and monitoring station, I tasked students with monitoring the weather in their respective localities for a week. This not only deepened their understanding of meteorological concepts but also fostered a sense of responsibility and real-world application of their knowledge. In another instance, I arranged for work immersion students to be assigned to an electronics company where they were asked to propose enhancements for the company's existing IT web page layout. Observing their progress, I noted that this project required them to apply their technical skills in a professional context, thereby enhancing their problem-solving abilities and creativity (Fernandez et al., 2024).

Through these experiences, I found that promoting active learning and engagement through field trips and work immersion programs significantly enhances student involvement by making learning more interactive and tangible (Salman, 2023). These hands-on experiences encouraged my students to take ownership of their learning, fostering intrinsic motivation and curiosity (Sánchez-Fuster et al., 2023). By stepping out of the traditional classroom setting and engaging with real-world scenarios, they developed a stronger connection to the material and could see its relevance to their lives. This active participation not only boosted engagement but also promoted critical thinking, problem-solving, and collaborative skills, ultimately leading to a more enriched and effective educational experience (Acut, 2022; Wu et al., 2023).

Improved understanding and application of scientific concepts

From my perspective, immersing students in real-world environments facilitated a deeper understanding of scientific principles. By seeing how theories are applied in practice, my students were able to make connections between classroom learning and everyday experiences. This practical application not only enhanced their comprehension but also fostered critical thinking skills as they analysed and interpreted their observations in relation to scientific theories. For example, when I organised a visit to a seismic station, students learned through hazard mapping how vulnerable their communities are to earthquake-induced landslides. This experience led them to develop their own mitigation plans anchored on disaster management principles, demonstrating a tangible application of their learning. Similarly, I observed STEM students immersed in a local agriculture office learning pest control management and applying these techniques in their farms, which significantly enhanced their understanding and skills.

Reflecting on these experiences, I found that improving the understanding and application of scientific concepts through immersive experiences has profound implications for education. When students actively engage with scientific principles in real-world contexts, they are more likely to retain information and develop a deeper understanding of the subject matter (Morag & Tal, 2012). This practical approach bridges the gap between theory and practice, enabling students to see the relevance of their classroom learning in everyday life (Zegwaard, 2015). Moreover, it promotes critical thinking as students analyse and interpret their observations, leading to a more comprehensive and applied understanding of scientific theories (Wu et al., 2023). Integrating these immersive experiences into the curriculum fosters a more enriched and effective educational experience, ultimately preparing students for real-world challenges.

Positive attitudes towards science

Through my observations and interactions with students during field trips and work immersion programs, I noticed a significant increase in their enthusiasm and curiosity towards science. Exposure to diverse scientific settings and interactions with professionals in the field seemed to spark interest in STEM careers and motivated students to pursue further studies in science-related disciplines. Students who participated in field trips offered through the science curriculum became more aware of pressing environmental issues like global warming and water pollution. Inspired by these real-world experiences, they developed innovative research projects, such as an Arduino-based water-monitoring robot designed to track aquatic health conditions. Additionally, another group of students created an Arduino-based photobioreactor to explore more sustainable methods of addressing carbon emissions by cultivating algae for carbon capture and biofuel production. To further contribute to environmental science, these students also developed a step-by-step guide for conducting these environmental monitoring projects, enabling others to replicate their work and extend its impact. These projects reflect the students' ability to apply classroom knowledge to solve environmental challenges through hands-on innovation, while also providing practical tools for future research and application (Fig. 3).

Similarly, another student participated in a work immersion program with an architectural firm, where she observed construction sites and engaged in real-world tasks. The experience sparked a deep interest in design and creativity, ultimately inspiring her to pursue a career

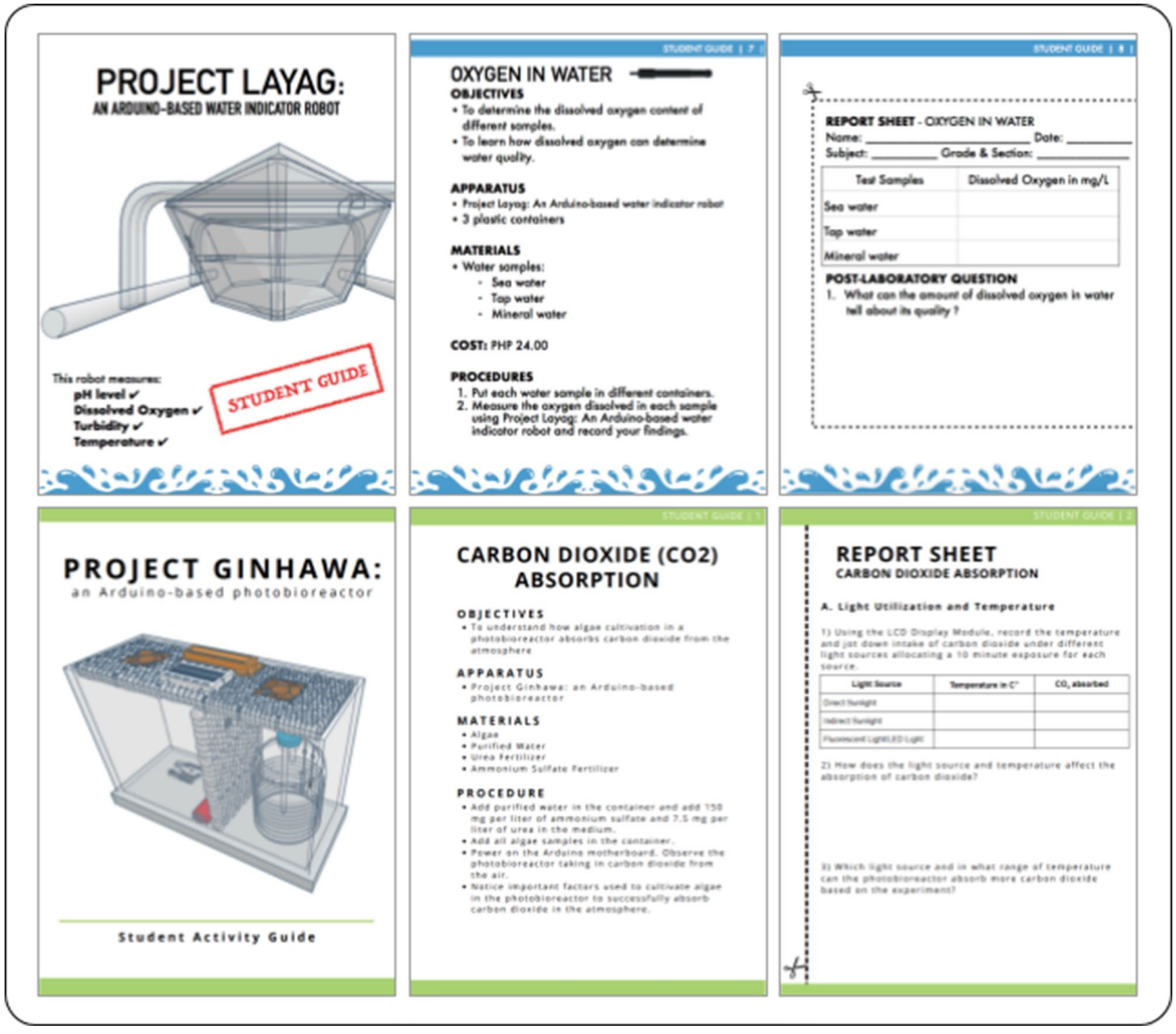

Fig. 3 Step-by-step guide for implementing Arduino-based environmental monitoring projects: water-monitoring robot and photobioreactor

in interior design. These experiences illustrate how field trips and immersion programs provide students with invaluable opportunities to bridge classroom learning and real-world skills, guiding their future career paths.

Evaluating these interactions, I realised that exposing students to real-world scientific applications and professionals in the field significantly increased their interest and motivation to learn science (Aničić & Divjak, 2022; Kong, 2021). This heightened interest often led to higher enrollment in STEM courses and a greater pursuit of science-related careers, addressing the growing demand for STEM professionals (Drymiotou et al., 2021). Additionally, these immersive experiences fostered a lifelong curiosity and appreciation for science, encouraging students to remain engaged with scientific issues and advancements throughout their lives (Klippel et al., 2019). Cultivating positive attitudes toward science through these programs can inspire the next generation of scientists, engineers, and innovators, ultimately contributing to scientific literacy and technological progress.

RQ2 What are the key logistical and risk management challenges encountered in the planning and execution of school field trips and work immersion programs, and how can these challenges be effectively addressed?

Logistical planning and coordination

Managing school field trips and work immersion programs presented a series of complex logistical and risk management challenges from my perspective. One of the primary difficulties I faced was the intricate planning required to organise these programs effectively. This involved coordinating transportation, securing permissions, and scheduling activities to align with both academic calendars and external factors. For example, I had to carefully consider the route to avoid heavy traffic jams and secure school buses for the trips, as other buses were allocated to transport non-participating students. This meticulous planning was essential to ensure that all students could participate without disrupting the regular school transportation system.

Budget constraints also posed significant challenges. The food allowance for teachers, drivers, and chaperones was tightly constrained due to the school's cost-cutting measures. This limitation forced me to budget carefully and negotiate with vendors to provide adequate provisions within the financial constraints. Additionally, synchronising the schedules of immersion company partners with our planned timeline was often difficult, requiring constant adjustments and flexibility. I frequently had to follow up with field trip venues, as many were slow to respond to emails, which often necessitated on-site visits to finalise arrangements. Limited space at some venues meant that I had to organise students into different batches, which compromised the school's regular activities and calendar.

Pondering these instances, I recognized that managing these logistical aspects was crucial to the success of the field trips and work immersion programs (Behrendt & Franklin, 2014; Tezcan et al., 2020). Effective planning and coordination were essential to ensure that the educational objectives were met while navigating the various constraints and challenges (DeWitt & Storksdieck, 2008). The need for constant adjustments and the impact on the school's regular schedule highlighted the importance of thorough preparation and flexibility (Zegwaard et al., 2020). By understanding and addressing these challenges, I was able to enhance the overall experience for both students and staff, ultimately improving the effectiveness of future trips and immersion programs.

Risk management and safety protocols

Ensuring student safety and implementing adequate risk management protocols emerged as a critical concern throughout the planning and execution of school field trips and work immersion programs. My responsibilities included assessing potential risks associated with travel, outdoor activities, and interactions with external environments. Mitigating these risks required comprehensive planning, clear communication of safety guidelines to participants, and collaboration with stakeholders to address emergency preparedness and contingency plans.

In practice, I coordinated closely with the school's clinic to review the health records of students with medical restrictions and ensured their medications and administration details were clearly outlined in their permit slips. I secured first aid and hygiene kits and verified that students were appropriately outfitted for each activity. Each bus had a designated teacher chaperone and a student disaster/health marshal to ensure everyone's safety. Before the field trip and immersion program, I conducted an orientation session to discuss the do's and don'ts, ensuring that students understood the safety protocols. I also prepared contact points for students' parents and guardians in case of emergencies and strictly implemented proper decorum inside the bus and at the venues.

Reflecting on these efforts, I realised that managing risk and safety was a multifaceted process that required vigilance, preparation, and effective communication (Salman, 2023). Ensuring the safety of students not only helped prevent accidents and health issues but also allowed students and staff to focus on the educational aspects of the trips without undue concern (Fountas et al., 2022). These measures fostered a sense of security among participants, which contributed to a more positive and productive learning environment (Hansen et al., 2022). Developing and implementing robust safety protocols created a safer

and more conducive atmosphere for experiential learning, ultimately enhancing the overall success and educational impact of the field trips and immersion programs.

Curriculum alignment and educational objectives

Aligning field trips and immersion programs with educational objectives and curriculum standards was essential but often challenging from my perspective. Balancing educational content with experiential learning opportunities while meeting administrative requirements and academic expectations required careful negotiation and collaboration with fellow educators and administrators.

To ensure these programs met curricular goals, I planned activities and worksheets that needed to be submitted at least a month in advance for thorough checking and evaluation. For students who were unable to participate due to valid reasons, I prepared make-up activities that were equivalent in weight to ensure fairness. Assessment techniques were a crucial part of the preparation, requiring thoughtful design to measure the educational impact effectively. I conducted ocular visits and inspections of the venues to ensure their conduciveness and alignment with the educational objectives. Additionally, constant monitoring and evaluation of these trips and programs were essential to gather feedback and make improvements for future implementations.

Drawing insights from these efforts, I recognized the importance of meticulous planning and continuous assessment in achieving educational alignment (Hansen et al., 2022). These measures ensured that the field trips and immersion programs were not only engaging but also educationally relevant and beneficial. By carefully aligning these activities with curriculum standards, I was able to provide meaningful learning experiences that complemented classroom instruction (Acut et al., 2021; Sánchez-Fuster et al., 2023). This approach not only reinforced theoretical knowledge but also fostered critical thinking and practical application skills in students, thereby enhancing the overall educational experience.

RQ3 What effective strategies and areas for improvement can be identified from the author's experiences in managing these programs to optimise their educational impact?

Collaborative planning and stakeholder engagement

In my experience managing educational programs, I have found that effective program management is deeply rooted in collaborative planning and active engagement with a diverse range of stakeholders. This process often involves teachers, administrators, parents, and community partners working together to align program goals with educational objectives and to garner strong support. For example, one of the most impactful strategies was formalising partnerships through memorandums of understanding (MOUs) with local companies (Acut et al., 2021; Hondonga et al., 2023). These agreements not only ensured that the programs were executed properly but also created opportunities for companies to showcase student achievements as part of their community outreach. Another vital aspect was collaborating with experts from national weather and seismic monitoring stations. Their input was crucial in developing high-quality student worksheets and activities, which greatly enriched the STEM education we provided. The experts' contributions were instrumental in creating meaningful and effective educational experiences for the students.

Collaborative meetings and culmination events became key elements in this process. They allowed us to gather feedback from all parties involved and share testimonies about the program's impact (Muzaffar et al., 2020). One standout example was working with local experts to create detailed and engaging student worksheets and activities. Their expertise not only improved the educational content but also enhanced students' engagement with high-quality STEM education. The culmination events were particularly noteworthy, as they brought together students and partners to share experiences, providing valuable insights and fostering a sense of community and shared purpose.

The implications of this collaborative approach were significant. Engaging a broad range of stakeholders enriched the educational experience by incorporating diverse perspectives and expertise. The involvement of community partners and experts ensured that the content remained relevant and of high quality, ultimately improving students' learning outcomes (Nguyen, 2022; Rodegher et al., 2024). Additionally, the collaborative efforts strengthened the relationships between the school and the community, creating a supportive environment conducive to student growth (Zegwaard et al., 2020). This experience underscored that effective collaboration not only enhances the impact of educational programs but also contributes to their sustainability and relevance, meeting the needs and expectations of all stakeholders involved.

Integration of reflective practices

Incorporating reflective practices throughout the program lifecycle emerged as a critical strategy for optimising educational impact (DeWitt & Storksdieck, 2008). Reflective practices involved ongoing evaluation of program effectiveness, soliciting feedback from participants, and adapting program activities based on lessons learned (Acut et al., 2021). By reflecting on successes and challenges, I could refine strategies, improve logistical operations, and enhance learning outcomes for future participants.

For instance, after a field trip, I conducted debriefing sessions where students shared their insights and suggestions for improvement. Surveys were distributed to gather more structured feedback, which often highlighted areas needing attention. My reflective journals served as a personal record of the challenges and successes encountered, offering a valuable reference for future program adjustments. Analysing data on program metrics allowed me to identify trends and areas for improvement, while long-term assessments helped in understanding the enduring impact of these experiences on students' academic and personal growth.

The integration of reflective practices had significant implications for the continuous improvement of educational programs (Hay, 2020; Kingkaew et al., 2023). By systematically evaluating and reflecting on each program, I was able to make informed decisions that enhanced the effectiveness and relevance of future initiatives (Luk & Chan, 2024). This approach not only improved logistical operations but also ensured that the programs met the evolving needs of students and aligned with educational objectives. Reflective practices fostered a culture of continuous learning and adaptation, ultimately leading to more impactful and meaningful educational experiences for all participants.

Adaptation and flexibility

The ability to adapt and respond flexibly to changing circumstances and participant needs was essential for optimising educational impact. This included anticipating and addressing logistical challenges, modifying activities to accommodate diverse learning styles and abilities, and seizing unexpected learning opportunities during field trips and work immersion experiences (Tembrevilla et al., 2023). Flexibility allowed me to capitalise on teachable moments and tailor experiences to maximise engagement and learning for all participants.

There were several instances where adaptability was crucial. For example, I frequently had to reschedule sessions, extend deadlines, and rearrange activities to ensure the program's effectiveness. Adapting activities to suit diverse learning styles and abilities was a regular practice; alternative formats were used when needed. If students expressed that a particular activity was too challenging or too simple, I made necessary modifications to better align with their needs. I often had to adjust plans on the fly during unforeseen circumstances such as weather disturbances and logistical issues, ensuring that educational goals were still met. Providing additional resources or one-on-one support for students who required extra help was another way I ensured all learners benefited from the program.

The adaptability and flexibility in program management had profound implications for the success of educational initiatives (Zegwaard et al., 2020). By remaining responsive to the changing needs of students and the dynamic nature of field trips and work immersion programs, I was able to create an inclusive and supportive learning environment (Wythe, 2023). This approach not only enhanced the overall educational experience but also ensured that all participants had the opportunity to engage fully and achieve their learning objectives. The ability to adapt and respond to unforeseen challenges demonstrated the importance of flexibility in educational planning and execution, ultimately leading to more resilient and effective educational programs (Molele et al., 2024; Zegwaard, 2015).

Program management framework

The visual framework for optimising educational efficiency in school field trips and work immersion programs integrates five interconnected pillars that collectively contribute to an effective educational experience (Fig. 4). At the centre of this framework is the central theme: "Optimising Educational Efficiency." This theme underscores the goal of maximising the educational benefits of these programs through strategic planning and execution.

The collaborative program management pillar emphasises the importance of engaging stakeholders, fostering community partnerships, and involving all parties in shared decision-making processes (Rybnicek & Königsgruber, 2018). By working collaboratively, the programs can draw on diverse perspectives and resources to create more robust and inclusive experiences for students. The reflective practices and continuous improvement pillar is committed to ongoing evaluation and adaptation. Gathering participant feedback, conducting thorough post-program evaluations, and adapting activities based on these insights are essential practices that ensure the programs continually evolve to meet educational objectives more effectively (Bresnen, 2016).

Moreover, adaptability and flexibility in the program design pillar highlight the need for programs to be adaptable and flexible to respond to unforeseen challenges. Implementing adaptive strategies, developing contingency plans, and making real-time adjustments enable the programs to maintain their educational impact even in the face of unexpected events (Cedergren & Hassel, 2024). The safety and risk management pillar focuses on conducting comprehensive risk assessments, establishing clear safety protocols, and preparing emergency procedures to protect students during field trips and work immersion programs (Chin et al., 2011).

The curriculum integration and educational alignment pillar ensures that the activities are closely aligned with educational objectives and curriculum standards. Integrating interdisciplinary learning, reinforcing classroom

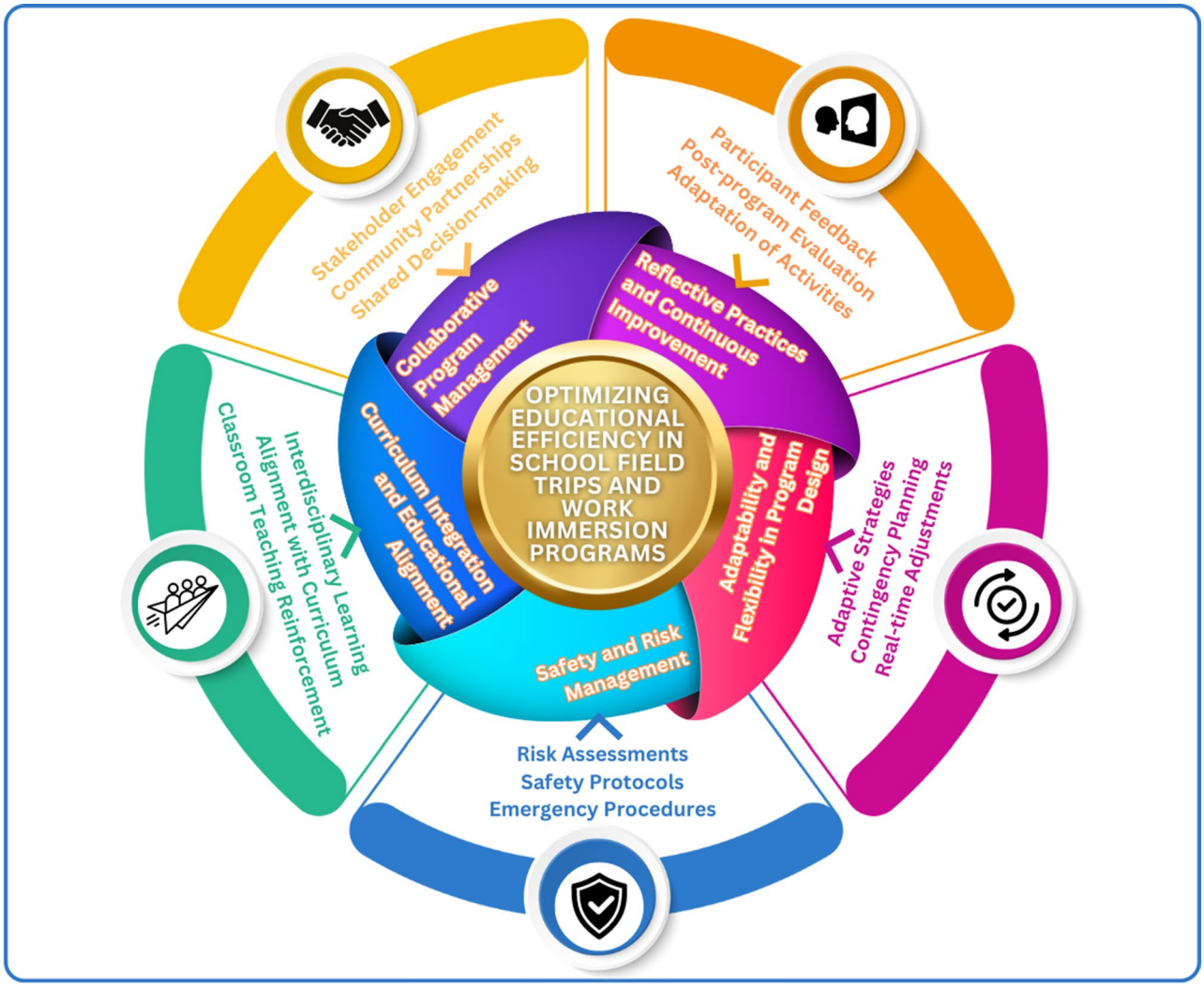

Fig. 4 Framework for optimising educational efficiency in field trips and work immersion programs

teachings, and ensuring alignment with the curriculum provide meaningful and relevant educational experiences (Gryson et al., 2024).

At the heart of the framework, this central theme ties together the five pillars, emphasising the goal of maximising the educational value of field trips and work immersion programs. Integrating collaborative management, reflective practices, adaptability, safety, and curriculum alignment enables educators to design and implement programs that are not only engaging and safe but also educationally impactful and efficient. This comprehensive approach ensures that students gain the most from their real-world learning experiences, fostering deeper understanding and practical application of their classroom knowledge.

Concluding thoughts

Reflecting on my journey in managing school field trips and work immersion programs, I have witnessed firsthand the profound impact these experiences have on student engagement and learning. By immersing students in real-world environments, their enthusiasm for science and their understanding of scientific principles have noticeably increased. Specific instances, such as students developing weather monitoring systems and creating water robots, illustrated how experiential learning cultivates critical thinking and problem-solving skills, bridging the gap between theoretical knowledge and practical application. Navigating logistical planning, risk management, and curriculum alignment presented significant challenges. Collaborating with stakeholders, adapting plans to meet diverse needs, and maintaining flexibility were crucial strategies for success. Reflective practices, such as post-event debriefings and ongoing evaluations, allowed me to continually improve the programs. These

efforts ensured that educational objectives were met, and students were prepared for future STEM careers. My experiences underscore the value of experiential learning and provide insights into enhancing educational outcomes through effective program management.

Abbreviations

IT Information Technology
MOU Memorandum of Understanding
STEM Science, Technology, Engineering, Mathematics

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Author contributions
The author contributed to all stages of the production of the manuscript from conception to execution of this autoethnographic study, including data collection, analysis, and writing. The findings, conclusions, and opinions herein represent the views of the author. The author read and approved the final manuscript.

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The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Competing interests
The author declares no competing interests.

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Publisher's note

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