International Journal of Evaluation and Research in Education (IJERE)
Vol. 14, No. 2, April 2025, pp. 1459~1467
ISSN: 2252-8822, DOI: 10.11591/ijere.v14i2.29883

Challenges and solutions in organizing geological field trips for Moroccan secondary school life and earth sciences teachers

Aâtika Eddif[1,2], Sabah Selmaoui[2], Hanaa Chalak[3], Radouan Chakour[2]
[1]Laboratory of Scientific Research and Pedagogical Development, Regional Center for Education and Training, Meknes, Morocco
[2]Interdisciplinary Research Laboratory in Didactics, Education and Training, Higher Normal School, Cadi Ayyad University, Marrakech, Morocco
[3]The National Higher Institute of Teaching and Education, Nantes, France

Article Info

Article history:

Received Jan 7, 2024
Revised Sep 17, 2024
Accepted Sep 30, 2024

Keywords:

Challenges
Difficulties
Earth sciences
Geological field trip
Geology

ABSTRACT

Teaching and learning earth sciences (ES), notably geology, are conducted across various environments, encompassing the classroom, laboratory, and, most significantly, the field. The field trip is recognized as a key component of practical training and the overall success of the educational process in ES. This paper elucidates the findings of a survey aimed at understanding the challenges faced by Moroccan secondary school teachers of life and earth sciences (LES) in organizing geological field trips. The survey sought to identify the difficulties these teachers encounter and propose potential support mechanisms to mitigate these challenges. The study revealed that teachers often do not arrange geological field trips due to challenges related to administration, personal factors, pedagogy, and didactics. In an effort to address this situation, the study underscores the importance of integrating practical work into teacher training and student education. It also emphasizes the need for the provision of more adequate teaching materials and logistical support to facilitate geological excursions, thereby enriching the appreciation of earth sciences disciplines among both teachers and students. Finally, the establishment of electronic collaboration between local Moroccan universities and secondary schools is recommended as a crucial step towards further improvement.

Corresponding Author:

Aâtika Eddif
Laboratory of Scientific Research and Pedagogical Development
Regional Center for Education and Training
Region of Fes-Meknes, Meknes-50010, Morocco
Email: aeddif@yahoo.fr

1. INTRODUCTION

Life and earth sciences (LES) encompass the instruction of geology and biology at the secondary school level. This study primarily focuses on earth sciences (ES), with a special emphasis on geological field trips. ES broadly encompasses both the realms of fieldwork and laboratory research. In this context, Sharp [1] elucidates that field and laboratory work are complementary, not opposing, aspects of ES. Field geologists often use laboratory analyses to enhance their fieldwork, while laboratory researchers use field data to enhance their studies. It is important to note that teaching and learning geology outside the classroom often involves field classes, geological field trips, and geological excursions. These are not only enjoyable social events but are integral to practical training, providing substantial benefits for both teachers and students. Fieldwork enriches learning by offering perspectives distinct from traditional classroom settings [2]–[4]. These experiences significantly enhance interdisciplinary and transversal content approaches and are

an ideal opportunity to integrate theory with practice. Marques and Praia [5] considers outdoor activities as strategies that foster more effective student involvement in the learning process, as well as promote collaborative work among students and better relationships between them and the teacher.

The role of geological field trips as an essential component of ES education cannot be overstated. ES instruction is centered on practical fieldwork, including activities such as observation and argumentation. This approach is pivotal for a comprehensive understanding of both external and internal Earth geodynamics, offering a coherent explanation of geological processes. Besides fostering a scientific mindset, it aims to equip students with essential field skills, enabling them to understand field methods and scientific approaches. The goal is to enhance their understanding and familiarity with geological phenomena, empowering them to make informed and responsible decisions and engage critically in everyday situations as responsible citizens. The comprehensive educational experiences provided through geological field trips extend beyond the classroom, enriching research and teaching areas by fostering a deeper, more practical understanding of ES among students. Official guidelines recommend basing the teaching of geology at the secondary level on observations made during field trips [6]–[8]. Other studies [6], [9], [10] also emphasize the role of ES in fostering environmental education, good citizenship, and awareness of geological heritage. Further expanding on this concept [11], drawing on the insights of [12], describes fieldwork as a versatile strategy that includes field trips, teaching, and research. This holistic view underscores the importance of acquiring geological field skills as a fundamental aspect of geoscience education.

An analysis of the ES curriculum in Morocco, according to the Official Instructions of the National Education for 2007–2009, demonstrates its significant presence in both secondary education (including the first two years of college) and in high school education (covering the initial two years of the *Baccalauréat* program). The curriculum encompasses comprehensive content, covering both external and internal Earth geodynamics, along with associated activities. Notably, the curriculum creators have placed a strong emphasis on the significance of geological field trips as an essential element of the LES curriculum. Teachers are actively encouraged to plan and execute these geological field trips in alignment with the ES programs, a directive reiterated in the Official Instructions of the National Education from 2007–2009 and various circulars by the Ministry of National Education, Vocational Training, Higher Education, and Scientific Research issued over the years (1971, 1973, 1975, 1979, 1999, 2015). These documents comprehensively cover aspects such as the authorization process, supervision, and the provision of these excursions at no cost. In geology, field trips are considered more crucial than in many other sciences for developing a proper understanding of space, scale, and time [13]. This perspective is supported by several researchers who have identified a range of benefits associated with geological field trips [14]–[17].

Participating in field trips offers numerous benefits that are crucial in the educational journey. Such trips provide students with invaluable educational experiences, effectively bridging the gap between theoretical knowledge and its real-life application. For students and professionals in ES, field experiences are particularly vital. They offer the unique chance to observe fundamental relationships in the natural environment directly. This engagement not only enhances skills in data collection and interpretation but also deepens the understanding of the subject. Moreover, these practical experiences play a crucial role in building social bonds among teachers and students, thereby fostering collaborative learning and professional growth. The advantages of field trips also include hands-on experience with field equipment, which contributes to a more positive and broader perception of science. This, in turn, encourages favorable attitudes towards geological sites and heightens environmental awareness. Furthermore, students have the opportunity to explore and interact with natural environments, which greatly enhances their understanding of various geological phenomena and objects in their actual settings. These field trips are instrumental in deepening subject comprehension, promoting inquiry, and stimulating curiosity.

The term ‘geological field trip’ encompasses various interpretations. According to Krepel and DuVall [18], it involves organizing educational excursions that enable students to engage directly with objects in their actual settings, fostering exploration and learning experiences. This definition highlights the importance of firsthand experience in geological learning, where students interact with geological phenomena in their natural environments. Carretier and Codognet [19] further expand on this concept, characterizing a geological field trip as an occasion where a group of students accompanied by one or more adults occasionally leaves the school premises for an hour, half a day, or full day, during regular school hours. offers an extensive explanation of geological field trips, describing them as organized investigative endeavors with clear goals that correspond to the ES curriculum. These trips engage students in the exploration of geological phenomena while also providing education and training that encompasses aspects like environmental stewardship, civic responsibility, and an appreciation of geological heritage. The activities, ranging from a single day to longer periods, are conducted away from regular school settings and are supervised and guided by educators such as teachers and various professionals [6]. Fieldwork is broadly

acknowledged as a valuable educational activity, yet some teachers are reluctant to involve their students in such experiences [20], Table 1 lists potential barriers to fieldwork, as identified in previous research.

This study draws inspiration from Morocco, often celebrated as a 'haven for geologists'. The country is home to a wide array of educational and geological sites that extend from north to south, providing a perfect setting for citizenship education, science teaching, and the appreciation of a diverse geological heritage that dates back to the Precambrian era. Our research primarily focuses on geological field trips, which are an effective way for students to interact with and understand this rich geological legacy through carefully planned activities. Remarkably, there is a scarcity of academic focus on this subject, particularly in the context of middle and high schools. To summarize, limited research exists concerning the challenges Moroccan secondary school teachers face in the ES field when organizing field trips and the potential solutions to these challenges. In an effort to address this gap, our research poses the following questions, what are the primary challenges faced by organizers of geological field trips and teachers of LES? Additionally, what support can be offered to help them overcome these challenges?

The objectives of this paper are threefold. Firstly, it aims to gain an understanding of the challenges teachers encounter when organizing geological field trips. Secondly, the paper seeks to offer potential solutions that could facilitate the integration of these trips into educational practices. Lastly, it endeavors to enhance the overall quality and educational value of geological field trips, ensuring they are an effective and enriching component of the learning experience.

Table 1. Academics' perception of the relative importance of potential barriers to fieldwork [20]

Potential barrier	Fido and Gayford	Kinchin	Fisher	Scott *et al*.
Large class sizes	✓	✓		✓
Time/timetable	✓	✓	✓	✓
Transport	✓	✓		
Enjoyment/internet of academic		✓	✓	
Cost	✓		✓	✓
Availability of suitable sites			✓	✓
Lack of curriculum specification			✓	
Complicated requirements of the national curriculum for field words			✓	✓
Risk of accidents			✓	✓
Low perception of the value of fieldworks by students			✓	✓
No contribution to academic's career promotion			✓	✓
Lack of suitable equipment				✓
Lack of academic knowledge about the outdoor setting				✓
Lack of academics' confidence of teaching in an outdoor setting				✓
Institutional culture				✓

2. RESEARCH METHOD

To ascertain the challenges teachers face when organizing geological field trips, we employed an anonymous questionnaire as detailed in Table 2. It is crucial to note that we personally developed the questionnaire items to align with the objectives of the LES program at the secondary school level. The questionnaire encompasses a range of question types, including open-ended, closed-ended, and multiple-choice formats. The items were phrased in Arabic to facilitate ease of response for the participating teachers. This questionnaire received validation from didactic specialists, educational inspectors, and trainers from the Higher Normal School, the Regional Centre for the Trades of Education and Training (RCTRT), as well as secondary school teachers from the Life and Earth Sciences Department. The research included a preliminary phase of interviews, referred to as exploratory studies. This initial phase was pivotal in affirming the relevance of our research topic and in shaping the questionnaire methodology for a subsequent quantitative study. In the initial stage of our investigation, we engaged with ten teachers for a pre-investigation phase. This involved the creation of tailored questionnaires and the subsequent compilation of responses. The survey was conducted over the 2018-2020 academic years. Following this, the analysis of the survey responses and the management of the collected data were performed using a quantitative approach.

Table 2. Objectives of the questionnaire questions

Questions	Objectives of the questions
Q1: closed question	To determine whether teachers are organizing geological field trips
Q2: multiple choice closed-ended	To rank, in descending order, the importance of organizing geological field trips
Q3: open question	To identify challenges that hinder the implementation of geological field trips by teachers
Q4: open question	To gather new suggestions or additional comments

2.1. Sample description

This study involved educators specializing in LES from public secondary schools across Morocco. The participant pool consisted of 450 teachers affiliated with various regional academies of education and training. Each participant held a bachelor's degree in either biology or geology and had teaching experience ranging from 2 to 20 years. The age of these LES teachers varied from 28 to 48 years, including both male and female educators.

2.2. Design and distribution of the questionnaire

The questionnaire was formulated based on insights from a pilot survey and aligned with the specific objectives of this research. It is structured into two main sections, adhering to a standard questionnaire format. The first section gathers demographic information about the respondents, including age, bachelor's degree specialization, and duration of teaching experience. The second section delves into the core research theme and comprises four questions (a detailed analysis is provided in a later section). The questionnaires were distributed effectively with the assistance of teachers who conducted interviews across various regions of Morocco. These teachers played an instrumental role in both the distribution of the questionnaires and the subsequent collection and relay of responses to the research team.

3. RESULTS AND DISCUSSION

After completing the distribution and collection of the questionnaire responses, we proceeded to a thorough analysis of the gathered data. This step entailed processing the responses, with the results presented as percentages for accuracy and precision. The findings are displayed using various formats, such as tables, pie charts, and bar graphs, ensuring clarity and enabling interpretation. This diverse presentation aids in effectively conveying the insights gathered from our participant pool of LES teachers.

3.1. Characteristics of survey respondents

The participant characteristics reveal a higher proportion of female teachers (59%) compared to male teachers (41%). This disparity may reflect a greater propensity among female educators towards teaching LES. Predominantly, the respondents held a bachelor's degree in biology, representing 95% of the total.

3.2. Analysis of questionnaire responses

In our analysis of the questionnaire responses regarding the organization of geological field trips, it was found that out of the 450 secondary school teachers surveyed, none had conducted such trips with their students. This collective response implies that these educators tend to omit such trips from their teaching methods, with further explanations explored later. In addressing the second question of our survey, we asked teachers to rank various elements of geological field trips in terms of importance, from 1 (most important) to 6. The aspects to be ranked included the trip's role as a social event to foster teamwork and enthusiasm, the adoption of eco-friendly actions, the opportunity for students to directly interact with extraordinary geological phenomena, the enhancement of students' understanding and skill development, the implementation of an engaging investigative method, and the acquisition of essential field skills such as geological techniques. These rankings provide valuable insights into the priorities and perceived benefits of geological field trips in secondary education.

Figure 1 in our report presents a graphical representation of the survey outcomes, showcasing the perceived significance of geological field trips in ES education and their diverse impacts on students. This figure highlights the various dimensions in which these geological field trips are valued, offering a comprehensive view of their potential educational benefits. The explanations of ranking in descending order are: i) 1 is enables students to directly engage with the actuality of extraordinary geological phenomena and examine geological objects within their respective contexts; ii) 2 is implement a lively and engaging investigative method; iii) 3 is to gain the essential skills in the field (geological techniques); iv) 4 is to solidify students' understanding and enhance their skill development; v) 5 is adopt eco-friendly actions; and vi) 6 is a nice social event: acquire the skill of collaborating within a team and cultivate a sense of enthusiasm.

The survey's results were enlightening. All 450 teachers (100%) agreed that the most effective aspect of geological field trips is enabling students to engage directly with geological objects in their natural context. This approach is seen as both enjoyable and interactive, offering an accessible learning experience. A substantial 98% of the participants acknowledged that geological field excursions serve as an engaging investigative method, enhancing students' curiosity, observational skills, and integration of knowledge, which in turn aids in the development of their skills. A significant 90% concurred that these trips are vital for students to acquire necessary field skills, such as geological techniques. Furthermore, 70% and 60% of the respondents, respectively, believe that geological field trips are instrumental in developing environmentally responsible

habits among students and fostering teamwork and enthusiasm. These findings underscore the varied benefits of geological field trips, revealing their crucial role in enhancing the educational experience in ES.

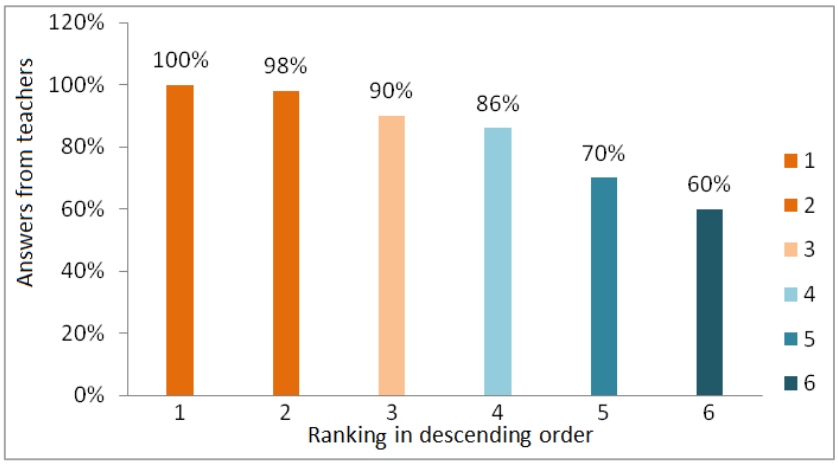

Figure 1. Ranking the geological field trip interests in decreasing order of importance

The third aspect of our investigation focused on identifying the challenges faced in organizing geological field trips. The research has identified a range of substantial obstacles, which are categorized into four key groups, each reflecting its primary concept. These are classified in order of their perceived importance as administrative, personal, pedagogical, and didactic challenges. Administratively, the process of organizing geological field trips is hindered by complex procedures and insufficient logistical support, especially in transportation and the provision of adequate teaching materials. A notable gap exists in the form of a lack of clear guidelines for educational sites, which would otherwise assist teachers during field excursions.

On a personal level, challenges arise from the teachers' backgrounds, predominantly those specialized in biology, who often lack formal experience in coordinating field trips. The absence of a standardized knowledge and skill set for teachers compounds this issue. Additionally, the complexity of secondary school LES programs, coupled with large class sizes, raises safety concerns, increasing the risk of accidents during trips.

There are numerous challenges from a pedagogical standpoint, including the lack of essential materials and tools required for conducting geological field trips. This shortage extends to educational resources such as methodological guides and digital resources necessary for targeted geological excursions. Teachers also face difficulties in managing student behavior in the field and effectively utilizing a diverse range of resources, while the lack of proficiency in essential field skills and instructional methods remains a significant obstacle.

Didactically, teachers struggle with incorporating field investigation approaches into the curriculum, particularly for complex geological concepts. There is a lack of awareness about valuable geological sites near schools and difficulties in executing the steps involved in conducting field trips. Teachers also face technical constraints in the field and occasional uncertainties in managing the dynamics among teachers, students, and the content during trips. These findings collectively highlight the various challenges that hinder the regular conduct of geological field trips, suggesting that such educational excursions are not always feasible under current conditions.

3.2.1. Additional comments on the survey

In response to the additional question in our survey, participants were given the opportunity to share their thoughts and provide comments or suggestions regarding the survey. The analysis of these responses, illustrated in Figure 2, shows that a majority of respondents (67%) are enthusiastic about participating in geological field trips aligned with the secondary school ES program, underscoring their importance in effective education. Moreover, 22% of those surveyed pointed out the necessity for continuous professional development to better manage these field outings, while 11% opted not to provide any feedback on this particular question.

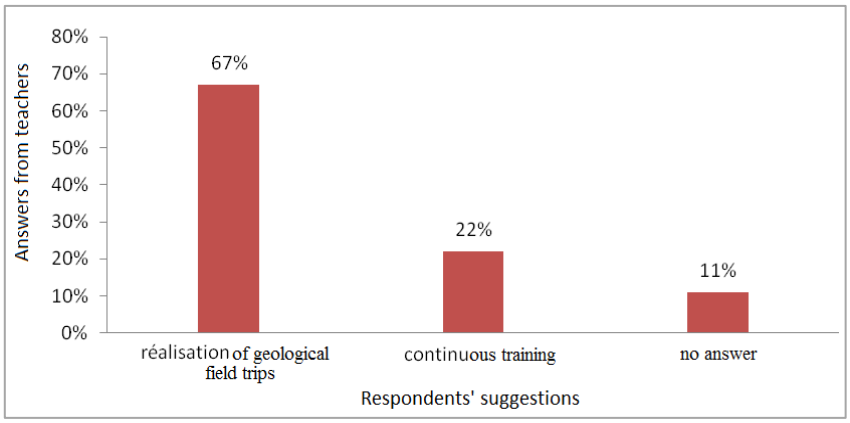

Figure 2. Respondents' suggestions

3.3. Discussion

The primary focus of this study is on the challenges faced by secondary school teachers in Morocco's various regional academies of education and training when planning geological field trips within the ES program. A noteworthy finding is the higher proportion of female teachers (59%) compared to male teachers (41%), a trend attributed to the greater propensity of female educators towards teaching LES. The majority of respondents, accounting for 95%, hold bachelor's degrees in biology. This demographic alignment is consistent with the findings of previous studies [21], [22], which noted a predominance of biology backgrounds among biology/geology teachers.

Our questionnaire analysis revealed awareness among teachers of the significance of geological field trips in ES education, aligning with Sanchez *et al.* [10]. Fieldwork is instrumental in problem-solving, clarifying observed phenomena, and bridging the gap between theory and practice. This assertion is supported by various studies [6], [9], [23]–[28].

Despite this awareness, 100% of surveyed teachers do not organize geological field trips, indicating a gap between understanding their value and actual implementation. The respondents cited numerous difficulties, falling into four broad categories, suggesting a disconnect between theory and practice in geological field trip organization. This aligns with the results of Eddif [6] and is further supported by other studies [22], [29], which, while not explicitly outlining these challenges, also highlight this gap. Geology's perception as a challenging and less popular science, coupled with the biology specialization of many teachers and deficiencies in their training, intensifies the challenges in ES instruction. This may necessitate a revision in teacher education to address these shortcomings.

Our study categorizes the encountered challenges into administrative, personal, pedagogical, and didactic challenges, suggesting that regular field trips may not be a consistent feature of ES programs. This finding is in line with [20], who identified various factors impeding tourism academics in higher education from incorporating fieldwork in their teaching, categorized into seven areas: institutional system, academics, organization, accidents, site, students, and social environment.

Fauquex and Fierz [29] highlights that, organizational challenges can hinder geography teachers from achieving their objectives. Similarly, Rodes [30] differentiates between scientific and didactic difficulties, noting that their impact varies according to the teacher's training. Lamarti *et al.* [31] focused on ES educators in university settings and identified key barriers to conducting geological field trips, such as administrative challenges, a lack of logistical and material resources, and concerns about student safety. Pruneau and Lapointe [32] study within the Quebec context of experiential learning acknowledged difficulties in integrating natural environments into school curricula, with constraints like limited time and financial resources impeding outdoor activities. Consistent with the findings of several studies [15], [33], [34], common obstacles like time constraints, curriculum alignment, and student behavior were identified. The study also revealed that some educators lack the motivation to organize field trips for their students.

These various studies collectively highlight similar challenges in planning geological field trips, albeit with regional differences. Therefore, the difficulties encountered are not unique to Moroccan teachers but are also prevalent among educators in diverse geographical areas. Many studies also suggest that organizing geological field trips in the learning aera can serve as an educational method to raise awareness about heritage preservation and sustainable development [35]–[38].

4. CONCLUSION

Our study has revealed that teachers of LES across different regional academies of education and training in Morocco, as well as educators in other countries, often refrain from organizing geological field trips due to various challenges. Our research identified four main groups of obstacles that hinder the organization of these field trips, categorized according to their key areas. Several strategies have been proposed to address these challenges. Firstly, there is a need for an integration of the research outcomes of Moroccan university geologists with their practical application in regional textbooks. This integration could entail adding a dedicated chapter on geological field trips in regional textbooks, thereby bridging the gap between theoretical knowledge and actual fieldwork conducted at local educational sites. Additionally, organizing regional and national forums centered on pedagogical geological field trips across Morocco's diverse structural regions is crucial. Such events are aimed at equipping teachers with the necessary training to facilitate direct interactions with geologists and practical fieldwork experiences that align with secondary school curriculum objectives.

In terms of the ES program, establishing an online academic database specifically for geological field trips would be significantly beneficial for educators. This database would provide detailed information on the scientific aspects unique to each educational site, the specific conditions of the field trip, and practical advice for student engagement. Another approach involves encouraging self-training among teachers as a form of ongoing professional development, as well as the use of virtual field trips led by experts, which can be integrated into the educational framework to offer an enhanced learning experience for students.

In situations where transportation is an issue, the design and construction of artificial pedagogical caves, equipped with features like stalactites and stalagmites, could be a viable alternative within educational institutions. Furthermore, building regional geological museums in areas accessible to learners would facilitate discovery and learning, either in person or virtually. Describing these museums in school textbooks and featuring them in media can further increase their educational value.

Proactive steps in the training of future LES teachers are also vital. Incorporating a module specifically on geological field trips into their education (training) could integrate theoretical knowledge with practical field experiences at relevant educational sites. Lastly, enriching school libraries with Morocco's latest geological and mining guidebooks, such as those published by the Ministry of Energy, Mines and Environment in Rabat in 2011, would provide valuable resources for both teachers and students. These comprehensive strategies aim to mitigate the challenges faced in organizing geological field trips and enhance the practical teaching of LES in Morocco and beyond.

REFERENCES

[1] R. P. Sharp, "Earth science field work: role and status," *Annual Review of Earth and Planetary Sciences*, vol. 16, no. 1, pp. 1–20, May 1988, doi: 10.1146/annurev.ea.16.050188.000245.

[2] C. Arcodia and C. Dickson, "Tourism field studies: experiencing the Carnival of Venice," *Journal of Hospitality & Tourism Education*, vol. 25, no. 3, pp. 146–155, Jul. 2013, doi: 10.1080/10963758.2013.826985.

[3] K. Ettenger, "Students as tourists and fledgling researchers: the value of ethnographic field courses for tourism education," *Journal of Teaching in Travel and Tourism*, vol. 9, no. 3–4, pp. 159–175, Dec. 2009, doi: 10.1080/15313220903379190.

[4] U. Gretzel, T. Jamal, A. Stronza, and S. K. Nepal, "Teaching international tourism: an interdisciplinary, field-based course," *Journal of Teaching in Travel and Tourism*, vol. 8, no. 2–3, pp. 261–282, Feb. 2009, doi: 10.1080/15313220802714562.

[5] L. Marques and J. Praia, "Science education: activities outside the classroom," (in Portuguese), *Terrae Didatica*, vol. 5, no. 1, pp. 10–26, Jul. 2015, doi: 10.20396/td.v5i1.8637493.

[6] A. Eddif, "Geological outing: what place in the life and earth sciences in the Moroccan secondary cycle?" (in French), *American Journal of Innovative Research and Applied Sciences*, vol. 10, no. 2, pp. 86–94, 2020. [Online]. Available: http://american-jiras.com/Eddif-Ref.3-ajiras010220.pdf.

[7] H. Esteves, P. Ferreira, C. Vasconcelos, and I. Fernandes, "Geological fieldwork: A study carried out with Portuguese secondary school students," *Journal of Geoscience Education*, vol. 61, no. 3, pp. 318–325, 2013, doi: 10.5408/12-394.1.

[8] H. Esteves, I. Fernandes, and C. Vasconcelos, "A field-based approach to teach geoscience: a study with secondary students," *Procedia-Social and Behavioral Sciences*, vol. 191, pp. 63–67, Jun. 2015, doi: 10.1016/j.sbspro.2015.04.323.

[9] J.-P. Jacob, "What's up? Tell me about your geology trip!" (in French), *Aster: Recherches en didactique des sciences expérimentales*, vol. 9, no. 1, pp. 177–203, 1989, doi: 10.4267/2042/9148.

[10] E. Sanchez, M. Prieur, and D. Devallois, "Teaching earth sciences in the second grade: classroom practices, difficulties, prospects for training," (in French), Lyon, France, 2004. [Online]. Available: https://acces.ens-lyon.fr/acces/thematiques/limites/didacgeo/publications/Rapport_de_recherche_enquete_enseignement_geologie_mai04.pdf

[11] I. C. Fuller, "What is the value of fieldwork? Answers from New Zealand using two contrasting undergraduate physical geography field trips," *New Zealand Geographer*, vol. 62, no. 3, pp. 215–220, Dec. 2006, doi: 10.1111/j.1745-7939.2006.00072.x.

[12] W. A. Dando and J. W. Wiedel, "A two-week field course with deferred papers: a possible solution to the problem of undergraduate field work," *Journal of Geography*, vol. 70, no. 5, pp. 289–295, May 1971, doi: 10.1080/00221347108981641.

[13] B. Ebbett and A. Lathrop, "An inexpensive, concentrated field experience across the Cordillera," *Journal of Geoscience Education*, vol. 54, no. 2, pp. 165–171, 2006.

[14] R. Scarce, "Field trips as short-term experiential education," *Teaching Sociology*, vol. 25, no. 3, pp. 219–226, Jul. 1997, doi: 10.2307/1319398.

[15] M. Michael, "Factors influencing secondary science teachers to organise and conduct field trips," *Australian Science Teachers Journal*, vol. 44, no. 4, pp. 43–50, 1998.

[16] C. Larsen, C. Walsh, N. Almond, and C. Myers, "The 'real value' of field trips in the early weeks of higher education: the student perspective," *Educational Studies*, vol. 43, no. 1, pp. 110–121, Jan. 2017, doi: 10.1080/03055698.2016.1245604.
[17] J. Kisiel, "An examination of fieldtrip strategies and their implementation within a natural history museum," *Science Education*, vol. 90, no. 3, pp. 434–452, 2006, doi: 10.1002/sce.20117.
[18] W. J. Krepel and C. R. DuVall, *Field trips: a guide for planning and conducting educational experiences. Analysis and action series.* Washington, DC: National Science Teachers Association, 1981.
[19] B. Carretier and A. Codognet, *School trips: a practical guide for middle and high schools.* CRDP de l'académie de Grenoble, (in French), 2002. [Online]. Available: https://cir.nii.ac.jp/crid/1130000796575887360
[20] Z. Li, Z. Zhao, S. Xin, and Y. Wang, "The barriers in organizing fieldwork-based learning trips in China: The tourism academics' perspective," *Journal of Hospitality, Leisure, Sport and Tourism Education*, vol. 26, p. 100240, Jun. 2020, doi: 10.1016/j.jhlste.2020.100240.
[21] C. Orange and D. O. Ravachol, "Geology and Biology: analysis of some epistemological and didactic links," (in French), *Aster: Recherches en didactique des sciences expérimentales*, vol. 21, no. 1, pp. 27–49, 1995, doi: 10.4267/2042/8635.
[22] R. Chakour, A. Alami, S. Selmaoui, A. Eddif, M. Zaki, and Y. Boughanmi, "Earth sciences teaching difficulties in secondary school: a teacher's point of view," *Education Sciences*, vol. 9, no. 3, Sep. 2019, doi: 10.3390/educsci9030243.
[23] K. Najoui and A. Alami, "Importance of practical work in teaching earth sciences at the Moroccan secondary qualifying schools," *American Journal of Innovative Research and Applied Sciences.*, pp. 230–239, 2017.
[24] Ministère de l'Education Nationale et de la Jeunesse, "Guide to organizing school outings and trips in secondary schools degré," Ministère de l'Education Nationale, Paris (in French), 2023. [Online]. Available: https://eduscol.education.fr/document/52179/download
[25] Merrheim, "The student placed in a research situation in a scientific field," (in French), Académie de Créteil. [Online]. Available: https://cardie.ac-creteil.fr/IMG/pdf/77chenri-wallon.pdf
[26] C. Lacoste, "The influence of fieldwork on geology learning," (in French), Ph.D. dissertation, Université de Limoges, Limoges, France, 2001. [Online]. Available: https://theses.fr/2001LIMO0013
[27] N. H. Karaca, F. B. Şenol, T. Akyol, and N. Aral, "Field trips in pre-school education," *The Journal of International Social* Research, vol. 9, no. 45, pp. 590–597, 2016.
[28] R. Chakour, A. Alami, S. Selmaoui, A. Eddif, and H. Chalak, "Conceptions of Moroccan secondary school students in relation to the 'integrative concept' of plate tectonics," *International Journal of Evaluation and Research in Education (IJERE)*, vol. 11, no. 4, pp. 2095–2105, Dec. 2022, doi: 10.11591/ijere.v11i4.21861.
[29] N. Fauquex and S. Fierz, "Teachers' views on field trips," (in French), Ph.D. dissertation, Haute École Pédagogique du Valais (HEP-VS), Saint-Maurice, Switzerland, 2017. [Online]. Available: https://doc.rero.ch/record/323929/files/Fauquex_Nicolas.pdf
[30] J.-F. Rodes, "Combining a forest outing with an online geolocation tool: what consequences for professional practice?" (in French), *RDST*, no. 6, pp. 163–186, Dec. 2012, doi: 10.4000/rdst.144.
[31] L. Lamarti, A. B. Bouziane, H. Akrim, M. Talbi, and M. M. Drissi, "Geo-terrain hypermedia: a relevant tool for learning field geology," (in French), *Revue internationale des technologies en pédagogie universitaire*, vol. 6, no. 1, pp. 46–54, 2009, doi: 10.7202/039180ar.
[32] D. Pruneau and C. Lapointe, "One, two, three, we'll go to the woods... Experiential learning and its applications in environmental education," (in French), *Éducation et francophonie*, vol. 30, no. 2, pp. 241–256, Jul. 2021, doi: 10.7202/1079533ar.
[33] A. Ateşkan, Ö. Dulun, and J. F. Lane, "Middle years programme (MYP) implementation in Turkey," *International Baccalaureate Organisation*, 2016.
[34] D. Anderson and Z. Zhang, "Teacher perceptions of field-trip planning and implementation," *Visitor Studies Today*, vol. 6, no. 3, pp. 6–11, 2003.
[35] A. Barthes, Y. Alpe, and S. Blanc-Maximin, "Is heritage education a tool for sustainable local development, or an instrumentalization of education to serve the labeling of territories?" (in French), *Revue francophone du développement durable*, 2016. [Online]. Available: https://amu.hal.science/hal-02471993/
[36] M. Lembezat, "Territory as a marker for educational tools for environmental education and sustainable development: the case of the Pyrénées-Atlantiques and its networks of players," (in French), *Géographie*, p. 186, 2016. [Online]. Available: https://policycommons.net/artifacts/15784030/le-territoire-comme-marqueur-des-outils-pedagogiques-deducation-a-lenvironnement-et-au-developpement-durable/16674889/
[37] L. Moretti, "Science teaching, interdisciplinarity and the learning territory: An action-research on the island territory of Corsica," (in French), *Éducation relative à l'environnement*, vol. 16, no. 2, pp. 1–21, Oct. 2021, doi: 10.4000/ere.8428.
[38] M. Behrendt and T. Franklin, "A review of research on school field trips and their value in education," *International Journal of Environmental and Science Education*, vol. 9, no. 3, pp. 235–245, 2014, doi: 10.12973/ijese.2014.213a.

BIOGRAPHIES OF AUTHORS

Aâtika Eddif is professor of higher education in Geology at Regional Center for Education and Training Trade Meknès (RCETT) since 2022. She was the secondary education teacher qualifying life and earth sciences at the Imame EL Boukhari Youssefia High School Morocco in 2007-2011. She got national doctorate in Geology at Mohammed V University, Faculty of Sciences Rabat in 2002 and graduate studies diploma (DES) at Chouaib Doukkali University Faculty of Sciences El Jadida, Morocco in 1998. The research centered on diverse components within the education system (curricula, learners and teachers, conception, heritage geological). The research has been the subject of several publications (books and indexed journals, conferences). She can be contacted at email: aeddif@yahoo.fr.

Sabah Selmaoui is associate professor of the Center for Research and Development in Education (CRDE), Moncton University, Canada. She is research professor in Didactics of Sciences (life and earth sciences) at Ecole Normale Superieure (ENS), Cadi Ayyad University, Marrakech since 1994. She is interested at the description and understanding problems in the teaching-learning of life and earth sciences. The research conducted focused on a variety of actors in the education system (curricula, learners and teachers). The research has been the subject of several publications (books and chapters, indexed journals, conferences). She can be contacted at email: sselmaoui@gmail.com.

Hanaa Chalak is assistant professor in Science Education (didactics of life and earth sciences) at the University of Nantes since 2014. Her research interests include the difficulties and didactic conditions of access to problematized knowledge by students, the practices of beginning and experienced teachers, and socially acute questions (SAQ) in education. She can be contacted via email: Hanaa.Chalak@univ-nantes.fr.

Radouan Chakour obtained his license in Earth and Universe Sciences at the Faculty of Science, Moulay Ismail University in Meknes. Subsequently, he continued his graduate studies at the Faculty of Science Agdal, Mohamed V University, in Rabat, which were capped by obtaining a master's degree in Earth, Sea and Environmental Sciences in 2008. In April 2020, he obtained his Ph.D. in Didactics of Life and Earth Sciences with first class honors. He is interested at understanding problems in the teaching-learning of life and earth sciences. The research carried out has been the subject of several publications (books and chapters, indexed journals, conferences). He can be contacted at email: radouan.chakour@usmba.ac.ma.