

ENTREPRENEURSHIP AS A CATALYST FOR THE DEVELOPMENT OF SOFT SKILLS IN ALGERIAN ENGINEERING SCHOOLS

L'ENTREPRENEURIAT COMME CATALYSEUR DU DEVELOPPEMENT DE SOFT SKILLS DANS LES ECOLES D'INGENIEURS EN ALGERIE

Lydia DJENNADI¹

Higher National School of Management, Tipaza, Algeria

Email: l.djennadi@ensmanagement.edu.dz

ORCID: 0000-0001-6286-3491

Nahla NAGA

Research Center for Applied Economics for Development, Algiers, Algeria

Email : n.nahla@hotmail.fr

ORCID: 0000-0001-7284-6871

Nadia GAHLAM

Higher National School of Management, Tipaza, Algeria

Email: n.gahlam@ensmanagement.edu.dz

ORCID: 0000-0002-4588-1337

Date of receipt 26/10/2024	Date of acceptance :15/01/2025	Date of Publication: 30/03/2025
----------------------------	--------------------------------	---------------------------------

Abstract:

This research aims to explore the purpose of integrating soft skills into engineering training programs in Algeria, as well as the various guidelines and mechanisms that promote the development of these skills. It is based on a qualitative study, involving the analysis of institutional texts, curricula, and a series of interviews conducted at three Algerian engineering schools. The findings indicate that the Algerian Ministry of Higher Education and Scientific Research actively encourages the development of soft skills, fostering the education of students to become responsible and entrepreneur. In this context, various institutional infrastructures have been established, along with initiatives such as Decree 1257 and the "Five-Star Student" program.

Keywords: Engineering training – entrepreneurial leaders - Soft skills

JEL Codes: I20 – I23

Résumé :

¹ Corresponding author: E-mail: l.djennadi@ensmanagement.edu.dz

Cette recherche vise à explorer la finalité de l'intégration des compétences transversales dans les programmes de formation des ingénieurs en Algérie ainsi que les différents dispositifs qui encouragent la formation à ces compétences. Elle se base sur une enquête qualitative à travers l'analyse des textes institutionnels, des curricula et une campagne d'entretiens menées dans trois écoles d'ingénieurs Algériennes.

Les résultats montrent que le Ministère de l'Enseignement et de la Recherche Scientifique algérien encourage le développement des compétences transversales et la formation d'un étudiant responsable et entrepreneur. Dans ce cadre, différentes infrastructures au niveau des établissements ont été inaugurées ainsi que des dispositifs tels que l'arrêté 1257 et l'étudiant cinq étoiles.

Mots clés : Compétences transversales - formation d'ingénieurs – entrepreneur

Code Jel : I20, I23

1. Introduction:

Engineers are commonly regarded as the architects of the modern world. Through their work, they help shape the future. Their primary role is to solve complex technological and technical problems. However, engineers can also serve as project leaders, team managers, company directors, and more. As Denis Lemaitre (2009) notes, "their profession is very rich and combines specific knowledge and practical activities from several different fields" (p.2). Today, engineers are viewed as responsible innovators, capable of meeting societal needs and addressing major contemporary challenges (Cardona Gil et al., 2018). Although not all engineers are involved in creating new products or services (whether through radical or disruptive innovation), their profession is "inseparable from the production of new technical or organisational concepts that mark the progress" of science and society (Hatchuel, 2020). This process is often referred to as incremental innovation.

In this spirit, and in alignment with recent international directives, the Algerian Ministry of Higher Education and Scientific Research (MESRS) is encouraging institutions to train responsible, forward-thinking, and entrepreneurial students by developing their soft skills and fostering innovation. Engineering schools, being part of the same educational framework, are also influenced by these incentives.

However, numerous studies in Algeria reveal that engineering curricula are not fully aligned with the needs of the professional world. For instance, Mohamed Benguerna (2011) highlights the lack of societal relevance in the courses offered, despite the inclusion of humanities, social sciences, and management sciences, which, according to him, are presented "within a technical-scientific framework." Moreover, recent research, as detailed in a previous article, indicates that the cross-disciplinary skills integrated into the training programs of the three schools are limited in scope (Djennadi et al., 2022).

The aim of our research is to understand the objectives of integrating soft skills into engineering curricula in Algeria today. Specifically, we seek to determine whether there

are external and internal pressures at the macro level or mechanisms at the meso level that promote the training of these skills. Additionally, we examine whether professors are trained in soft skills and effective teaching methods to impart these skills to future engineers.

This study, situated within the sociology of the curriculum, employs a qualitative research approach. It involves an analysis of institutional texts and curricula from three Algerian engineering schools: the National Polytechnic School, the National Higher School of Informatics, and the National Higher School of Agronomy. The study also includes a series of interviews with professors and academic advisors from these institutions. Conducted between 2018 and 2021 as part of an international research project on engineering education, the research was subsequently updated with additional surveys in 2023 to enhance and complete the findings.

2. Soft skills: Theoretical framework

The cultivation of soft skills in students has increasingly become a crucial element for enhancing employability and ensuring successful career trajectories. Many higher education institutions have effectively equipped students with skills and competencies that align with labor market demands (Igwe et al., 2022). Certain academic institutions have implemented specialized programs designed to highlight the significance of soft skills and facilitate their development within the campus environment. These initiatives aim to address both tangible and intangible skills, acknowledging the equal importance of both in achieving career success (Mwita et al., 2023). Such comprehensive programs stress the necessity for students to acquire transversal skills, often developed concurrently with technical and scientific expertise. This acquisition can occur explicitly through interdisciplinary and multidisciplinary approaches or implicitly as natural by-products of contexts where technical and scientific skills are cultivated (Sá & Serpa, 2018). Fundamentally, the focus is on a holistic educational approach, integrating the development of soft skills into the overall educational experience to ensure that students are well-rounded and prepared for the multifaceted challenges of the professional landscape.

Soft skills have become a prominent trend in both educational settings and the professional world (Coulet, 2019). These skills are variously referred to as "cross-curricular skills," "non-academic skills," "transferable skills," "generic skills," or even "general skills." They encompass "skills that are not specific to a particular profession or sector" (Labbé et al., 2019, p. 64).

According to Tardif and Dubois (2013, p. 31), "a skill is considered transversal because it lacks a disciplinary or professional anchor. In this regard, it is general in comparison to disciplinary, specific, or professional competencies." Consequently, in the academic context, it is not tied to a specific specialty or field.

Soft skills are distinguished from academic skills by their "broader scope, transcending the boundaries of each discipline and area of learning. They are not directly related to subject-

specific teaching but require a range of knowledge, concepts, skills, and attitudes to accomplish complex tasks" (Prayal & Gignac, 2004, p. 8). These skills can thus be taught across various specialties and professions.

"Soft skills are related either to methodological knowledge (know-how that can be transferred from one activity to another) or to behavioral knowledge (life skills associated with self-esteem or appropriate behavior for problem-solving or handling situations)" (Morlaix & Nohu, 2019).

The term "soft skills" closely resembles the transdisciplinary approach, which signifies an integration "beyond" traditional disciplines. This approach advocates for the holistic development of students, encompassing personal growth, initiative, creativity, autonomy, and other attributes. By situating students within project-based contexts, the subjects in the curricula address the need for knowledge and learning (Prayal & Gignac, 2004). In this context, active pedagogical methods, including project-based, problem-based, and simulation-based teaching, can be advantageous for the acquisition of cross-curricular skills.

In summary, soft skills are those not specifically tied to any particular profession or field. They are not anchored in a specific discipline but are relevant across multiple disciplines and professional specialties. In relation to our research, soft skills are crucial for the professionalization of engineers, preparing them for both the job market and entrepreneurial ventures.

Frameworks for skills are established in various countries, depending on the profession and sector. These frameworks often include benchmarks for the competencies of engineers, managers, and other roles. Such reference frameworks may encompass both academic and non-academic skills necessary for professional practice.

Researchers and scholars have identified several types of skills or competencies, some of which are reflected in these frameworks. For instance, three types of soft skills commonly expected by professionals in the workplace include interpersonal skills, relational skills, and work attitudes.

Interpersonal skills pertain to personal and behavioral qualities within a professional setting. Relational skills involve an individual's capacity to engage effectively with others. Work attitudes encompass aspects such as stress management, conflict resolution, and motivation.

In its 2017 report, the French Skills Employment Network identified two primary categories of soft skills: "those based on fundamental knowledge that are not specific to a particular professional context but are essential across numerous professions, such as basic office automation knowledge; and those encompassing behavioral, organizational, or cognitive aptitudes, or general knowledge relevant to various professions or professional scenarios, including customer relationship management, teamwork, project coordination, adaptability to the work environment, and proficiency in major office software.

Prayal and Gignac (2004) and Tardif and Dubois (2013), through their examination of the training program at a Quebec institution, identified four categories of soft skills:

- Intellectual skills (e.g., information utilization, problem-solving, critical judgment, and critical thinking);
- Methodological skills (e.g., effective working methods, use of information and communication technologies);
- Personal and social skills (e.g., identity structuring, cooperation);
- Communication skills (e.g., effective communication).

In its 2017 report, the French Employment Skills Network provided examples of soft skills categorized into four main domains: cognitive skills (e.g., context identification and analysis, personal needs assessment, self-evaluation), interpersonal and communication skills (e.g., teamwork, communication with clients and colleagues, active listening, adherence to rules), strategic and organizational skills (e.g., emergency and stress management, problem-solving, resource optimization, complexity management), and attitudinal skills (e.g., autonomy, initiative, leadership).

Additionally, Tardif and Dubois (2013) discussed other competencies crucial for nursing training, including problem-solving, communication, sense of responsibility, creativity, and adaptability to new situations.

A further classification, proposed for prospective students, encompasses three categories of soft skills: personal skills (e.g., initiative, resilience, responsibility, risk-taking, creativity), social skills (e.g., teamwork, empathy, compassion, co-construction), and cognitive skills (e.g., management, organization, metacognition, proactivity).

Communication, teamwork, cooperation, and problem-solving are recurrently highlighted in various rankings compiled by researchers and within consulted reference systems. Also noted are competencies such as a sense of responsibility, critical thinking, environmental and contextual adaptability, along with newer skills like co-construction, empathy, and metacognition.

3. Higher education in Algeria in the light of soft skills and the entrepreneurial spirit

The higher education system in Algeria faces numerous challenges, one of which is aligning higher education with employment needs. To address these challenges, the Ministry of Higher Education and Scientific Research (MESRS) has established three primary objectives: restructuring through various reforms, including the adoption of the LMD system; professionalization through the establishment of links with the socio-economic sector; and excellence through the creation of centers of excellence designed to train high-level engineers, managers, and executives. Concurrently, MESRS has announced several specific measures, such as accelerating the training of trainers to certify teachers' soft skills, with the aim of enhancing the quality of education. These initiatives are intended to bring

about a substantial transformation in Algeria's higher education landscape, aiming to significantly improve the system's responsiveness to the evolving demands of society and the national economy. According to Djamal Boukezzata (2016), Director of Higher Education at MESRS, higher education is preparing to meet new challenges by updating future training programs. The objective of these programs, as stated by Boukezzata, is to develop soft skills and to train responsible, leadership-oriented, and entrepreneurial students. These adjustments will address the needs of the socio-economic environment through: the development of individualized training programs and work placements in companies; the establishment of connections between universities and businesses; and the enhancement of national and international mobility.

According to "Executive Decree No. 16-176 laying down the standard statute for higher education institutions," one of the missions of higher education institutions in Algeria is to "train highly qualified executives, and to promote entrepreneurship and innovation." This mission necessitates the development of so-called "soft" skills. Acquiring these skills enables learners to develop general competencies that facilitate adaptation to various contexts, situations, and transformations (Tardif & Dubois, 2013).

In recent years, the Ministry of Higher Education and Scientific Research (MESRS) has aimed to reduce the unemployment rate among young university graduates. This objective includes fostering an entrepreneurial spirit among students and integrating entrepreneurship into the initial training programs across all disciplines. Recently, the Minister for Higher Education and Scientific Research, Kamel Baddari, and the Minister for the Knowledge Economy, Start-ups, and Micro-enterprises, Yacine El-Mahdi Oualid, inaugurated 102 Entrepreneurship Development Centers at various universities, university centers, and schools nationwide, along with 98 incubators, 29 artificial intelligence laboratories, three technoparks, 26 fab labs, and other facilities.

This initiative seeks to facilitate the professional integration of university graduates into the labor market while encouraging them to contribute to economic development. Additionally, a specific status for student-entrepreneurs and a diploma associated with this entrepreneurial focus have been introduced. Within these infrastructures and through the aforementioned programs, students develop cross-disciplinary skills that promote effective business management and problem-solving as emerging entrepreneurs. This dynamic is also evident in engineering schools, which feature Entrepreneurship Development Centers, incubators, fab labs, and other facilities aimed at training entrepreneurial engineers prepared to establish their own businesses.

To advance the development of non-academic skills, a program has been established by the supervisory body to confer the title of 'Five-Star Student.' This program comprises a five-stage process throughout the student's university education (bachelor's degree, master's degree/engineering degree):

- Academic Performance: Achieving a ranking among the top students;

- Enhanced Links with the Business World: Engaging in practical case studies within companies;
- Development of Professional and Cross-Disciplinary Skills: Through foreign language acquisition, proficiency in IT tools, participation in sports activities, etc.;
- Completion of a Distance or Mobile Training Course (MOOC);
- Community Involvement and Engagement: Participation in charitable activities, student tutoring, serving as a student delegate, etc.

4. Research Methodology

This paper builds upon the research conducted by Djennadi et al. (2022), published in *Les Cahiers du CREAD*. The prior study investigated the soft skills targeted by engineering training programs and the methods employed to raise student awareness of their importance. The previous research indicated that institutions have incorporated several cross-disciplinary units and introduced programs such as Indjaz el Djazair and FIE to develop these skills in students. However, the skills emphasized are frequently instrumental and utilitarian. Furthermore, while some professors and academic advisors are working to strengthen connections with the socio-economic sector through seminars, company visits, and increased practical placements, others remain disengaged and do not prioritize these aspects. Interviewees in the previous study reported a lack of resources, citing insufficient teaching conditions as a barrier to optimal training in soft skills.

The objective of our current research is to further explore and understand the goals underlying the integration of soft skills into engineering curricula in Algeria. We aim to elucidate the intentions and motivations behind the teaching of these skills within the current context of engineering education in Algeria.

This research aligns with the sociology of the curriculum, which views the curriculum as a process involving the selection, structuring, and transmission of knowledge by various actors at different levels (Young, 1971; Bernstein, 1975; Forquin, 2008).

Our methodology involves a two-phase process: first, a documentary analysis of institutional texts (political speeches, official communication portals, legal documents, etc.) and an examination of the training offered by engineering schools; second, a discourse analysis based on interviews conducted within these institutions.

The study sample includes three major public engineering schools in Algeria: the National Polytechnic School, the National Higher School of Informatics, and the National Higher School of Agronomy. Initially, we reviewed and analyzed the curricula offered by these institutions. Subsequently, we conducted approximately thirty semi-structured interviews, ranging from 30 minutes to two hours, with professors and academic advisors at the selected schools. These interviews aimed to elicit their perspectives.

The questions addressed engineering training in general, its objectives, the types of engineers trained, the construction of curricular offerings, the targeted soft skills, the support systems for future engineers, and the constraints and perspectives of key stakeholders in engineering education in Algeria. The interviews were conducted using convenience sampling followed by snowball sampling.

A discourse analysis of the transcribed interviews was performed to understand the concepts expressed by the interviewees. This analysis focused on identifying the meanings ascribed by the participants and the reference frames employed.

5. Soft skills training in Algerian engineering schools

The Algerian education system, particularly in the realm of engineering training, is largely modeled on the French system, a pattern observed in countries historically influenced by French colonization. Until recently, engineering education in Algeria was exclusively provided by engineering schools, which were the sole institutions authorized to offer such programs. However, today, certain universities, including the Houari Boumediene University of Science and Technology, have also begun to offer engineering programs. These universities have established programs of excellence in collaboration with industry professionals to develop their curricula.

This study focuses on three prominent Algerian engineering schools: the National Polytechnic School (ENP), the National Higher School of Informatics (ESI), and the National Higher School of Agronomy (ENSA). These institutions, which admit students through integrated preparatory classes, are well-regarded in Algeria. Their curricula are validated by the Ministry of Higher Education and Scientific Research (MESRS) rather than by external accreditation bodies such as the Engineering Titles Commission (CTI) or the Accreditation Board for Engineering and Technology (ABET). External recommendations are primarily provided by the supervisory authority. Generally, the core technical courses remain relatively stable over time. In contrast, the introduction of new cross-disciplinary courses is often a matter of individual choice, as corroborated by the interviews conducted. Faculty members stay informed about developments in advanced countries, particularly those where they completed their higher education, and update their curricula based on their personal observations.

Previous research by Djennadi et al. (2022) indicates that these schools offer courses designed to develop cross-disciplinary skills, such as business management, sustainable development, standardization, English, writing and communication techniques, and an introduction to entrepreneurship. However, the number of teaching hours allocated to these subjects is relatively small, with the exception of certain specializations. Additionally, these institutions aim to strengthen their connections with the socio-economic sector by establishing agreements with various organizations that facilitate student internships. Such internships are mandatory for ENP and ESI students, but optional for ENSA students, who either visit companies or participate in field trips, depending on their specialization. Ideally,

these professional training activities are intended to provide insights into the industrial world and direct exposure to the realities of the profession. In practice, however, professors report that companies often do not assign meaningful tasks to students. Consequently, most internships amount to mere observational or documentary analysis experiences. The collaboration between schools and companies remains weak, and efforts to jointly develop training that aligns with the needs of the socio-economic world are limited.

This lack of collaboration represents a missed opportunity for mutually beneficial partnerships. The primary barrier to effective collaboration is the insufficient financial support from companies for research projects, which discourages schools from forming partnerships with the industrial sector. This funding gap restricts the potential for creating dynamic and innovative collaborations between academic institutions and industry. Moreover, the lack of communication between the socio-economic sector and educational institutions fosters mistrust of national competencies, leading some companies to seek advice and conduct research abroad.

Nahla Naga (2023) highlights that the absence of intermediary structures dedicated to facilitating industry-school interactions impedes the development of collaborative projects. She argues that establishing such structures could enhance exchanges, build mutual trust, and encourage innovative collaborations, thereby fostering a more dynamic synergy between academia and industry. According to the interviews conducted, the MESRS has attempted to address these issues by establishing the Bureau de Liaison Entreprises/Université (BLEU), which aims to strengthen ties between institutions and companies, develop a relational network, collaborate with researchers and scientific clubs, and manage student placements in companies.

Managers interviewed reported that the engineering schools in question have established Entrepreneurship Development Centres, incubators, Business/University Liaison Offices, Fablabs, and Technology and Innovation Support Centres (CATIs). These initiatives are supported by the new order 1275, which aligns with MESRS directives.

The Entrepreneurship Development Centre (CDE), formerly known as Maisons de l'Entrepreneuriat, are established within universities, schools, and university centers, under the supervision of two ministries: the Ministry of Higher Education and Scientific Research and the Ministry of the Knowledge Economy, Start-ups, and Micro-Enterprises. According to Yacine El Mahdi Walid, the Minister for the Knowledge Economy, Start-ups, and Micro-Enterprises, the role of these centers is "to support university project holders by providing them with intensive entrepreneurship training and enabling them to access funding." The interviewees indicate that these centers collaborate directly with NESDA (National Entrepreneurship Support and Development Agency), formerly ANADE (Agence Nationale d'Appui et de Développement de l'Entrepreneuriat). The missions of the CDEs include raising awareness about entrepreneurship among all students, regardless of their year or field of study, and providing training and support for entrepreneurs.

Awareness is promoted through workshops, conferences organized in collaboration with entrepreneurs, experts, and professionals, competitions, trade fairs, and study days, among other activities. Training at these centers is delivered by university instructors, NESDA trainers, and entrepreneurs (mentors). The training is provided over a period of 15 days across three weeks, following a standardized guide with clearly defined themes. This uniform training is offered in all CDEs nationwide. Thus, the CDEs, through their diverse activities and missions, contribute to the development of students' soft skills.

Additionally, incubators have been established within universities and engineering schools, serving as facilities where start-ups can be nurtured. These incubators provide project leaders with soft skills and assist them in addressing potential challenges associated with launching their start-ups. They also offer a network of material and human resources, personalized coaching, expertise, and field experience.

Centers for Technology and Innovation Support (CATIs) are dedicated to supporting faculty and students with matters related to industrial property. They provide access to patent databases, assistance and advice on intellectual property management (including patent drafting), and support for company formation (such as trademark registration), among other services.

Finally, Fablabs are viewed as hubs for learning and innovation, where project leaders can access tools and equipment necessary for bringing their inventions to fruition. These facilities enable them to create, manufacture, experiment, and rapidly transition from concept to prototype.

Order 1275, published in September 2022, introduces the "one diploma, one start-up" or "one diploma, one patent" mechanism. This order is part of the MESRS's new policy aimed at enhancing the value of student work and projects and at training future entrepreneurs who will create their own employment opportunities. Information and awareness-raising events are organized to guide students in developing innovative projects that align with this scheme, aiming to obtain either an "innovative project label" or a "start-up label." These labels provide student project leaders with access to support, funding, and tax and social security incentives established under the scheme. Ministerial order 1275 consists of 11 articles and focuses on four main areas: the educational aspect, awareness-raising and coaching, the relationship with the socio-economic environment, and patents and labels. Students interested in this decree can utilize the services provided by their schools' incubators and CDEs. They are required to prepare a final year project and a Business Model Canvas (BMC). Additionally, they will receive training and coaching on the BMC, digital marketing, management, and financing, which will be evaluated by the CDE.

As a result, and as previously noted, the students involved in these initiatives, within the context of prospective business creation, develop soft skills through these infrastructures. Future engineers, for example, learn to solve problems using design thinking methodologies and to collaborate in teams on their projects. They also acquire competencies in

communication, responsibility management, conflict resolution, critical thinking, and situational adaptation. Additionally, they are encouraged to innovate and address practical problems by proposing novel products or services. Participation in national and international competitions further facilitates their learning, enabling them to present and summarize their work effectively, adhere to time constraints, and manage stress during start-up pitches. These experiences align with the classifications of Prayal and Gignac (2004), Tardif and Dubois (2013), as well as the framework proposed by Redecker et al. (2011), which was cited by Tardif and Dubois (2013) regarding the competencies students need to master for the future. However, it is important to note that not all students in the institutions studied engage in the development of soft skills, as only project leaders are involved.

Despite the Ministry's announcements concerning the training of trainers, interviews reveal that practical training in cross-disciplinary skills remains inadequate. Interviewees expressed concerns about the lack of support, indicating that trainers often engage in self-directed learning and training. The majority of teachers at the institutions studied had not received training in the instruction and transmission of soft skills. This finding corroborates the observations of Hamadou (2013) and Barberis and Aissi (2023), who noted that both initial and in-service training are insufficient. Many educators rely on traditional teaching methods, although some employ active teaching techniques, simulations, or mini-projects to develop behavioral, relational, and organizational skills. Others noted that the assessment of cross-disciplinary skills remains problematic and ambiguous, with discrepancies between what is taught and what is assessed in the curriculum. This suggests a potential benefit from research utilizing participant or non-participant observation.

According to the interviews, there appear to be gaps in the assimilation of soft skills among all engineers trained in the studied institutions. Not all engineering students display equal interest in disciplines aimed at developing soft skills, nor do they demonstrate enthusiasm for the aforementioned mechanisms. These skills are often perceived as non-essential to their training, leading to a predominant focus on scientific and technical subjects, particularly within the demanding context of preparatory or core classes characterized by a dense curriculum. This observation underscores the necessity for higher education institutions to modernize their pedagogical practices by adopting contemporary approaches that facilitate the acquisition of these skills. Specifically, active collaboration between teachers and students is deemed crucial for the effective integration of these competencies (Amghar & Naga, 2023).

6. Conclusion :

Our research indicates that the Algerian Ministry of Higher Education and Scientific Research is actively promoting the development of soft skills and the training of responsible, leadership-oriented, and entrepreneurial students as a strategy to mitigate the unemployment rate among recent graduates. In response to these directives, various infrastructures have been established at engineering schools, including Entrepreneurship Development Centres,

incubators, and Business/University Liaison Offices. Additionally, initiatives such as Order 1257 and the "five-star student" program have been introduced. Through these educational frameworks and associated programs, students are expected to develop soft skills. However, as previously noted, not all future engineers benefit from these opportunities, as such training is typically reserved for project leaders.

It is also important to highlight that the categorization of these skills is not explicitly defined in the recommendations and requirements set by the supervisory authorities. Moreover, there is a lack of robust connections, such as co-construction or networking, between the schools, the Ministry of Higher Education and Scientific Research (MESRS), and socio-economic stakeholders concerning the cross-disciplinary skills to be imparted to future engineers.

The research conducted across three engineering schools provides insight into the training of soft skills within these institutions. However, it is not representative of all Algerian engineering schools. Future research should encompass four additional prominent engineering schools that form a technological center of excellence in Algiers: the National School of Artificial Intelligence, the National Higher School of Mathematics, the National School of Nanoscience and Nanotechnology, and the National Higher School of Autonomous Systems Technology. These institutions, having been recently established, have yet to graduate their first cohort. Further investigation into the assessment of these skills will also be pertinent.

7. Bibliography:

Amghar, M., Naga, N., & Zouambi, A. R. (2023). Transversal Skills in the Academic Curriculum of Management School Students in Algeria. *Economics and Business*, 37(1), 172-188.

Benguerna, M. (2011). La formation des ingénieurs à l'épreuve des nouvelles compétences sociales. In *Gestion des entreprises, nouvelles compétences sociales et défis interculturel*. Editions du CREAD.

Berberis, S., & Aissi, R. (2023). L'utilisation pédagogique de la plateforme Moodle par les enseignants de FLE : difficultés et besoins de formation en contextes universitaires algériens. 8(2).

Bernstein, B. (2007). Pédagogie, contrôle symbolique et identité : Théorie, recherche, critique. *Revue française de pédagogie*, n° 158(1), 165-168.

Bouras, L. (2023). Arrêté ministériel n°1257 : Marchéisation de l'université ! La Revue des Sciences Commerciales, 22(1), 172-191.

Cardona Gil, E., Gardelle, L., & Tabas, B. (2018). De l'innovation technologique à l'innovation " située " : Pour une meilleure adaptation des formations d'ingénieurs aux défis sociétaux du XXIe siècle. In D. Lemaître (dir.) (Éd.), *Formation des ingénieurs à l'innovation* (p. 19-34). ISTE Éditions. <https://hal-ensta-bretagne.archives-ouvertes.fr/hal-01761600>

Coulet, J.-C. (2019). Compétences transversales : Quelques suggestions pour s'affranchir d'un mythe. *Recherches en éducation*, 37, Article 37. <https://doi.org/10.4000/ree.802>

Djennadi, L., Benguerna, M., & Gardelle, L. (2022). La place des compétences transversales dans la formation des ingénieurs en Algérie. *Les Cahiers du Centre de recherches en économie appliquée pour le développement*, 38 (04), 91.

Forquin, J.-C. (2008). *Sociologie du Curriculum*. PU Rennes.

Gignac, M., & Prayal, M.-F. (2004). Les compétences transversales acquises en situation de formation à distance : Document préparé pour le Réseau d'enseignement francophone à distance du Canada. Réseau d'enseignement francophone à distance du Canada (REFAD).

Hamadou, T. (2013). De la formation pédagogique : État des lieux. *Revue des pratiques langagières LPLA*

Hatchuel, A. (2020). *Les contributions de l'ingénieur face à la menace climatique : Nouveaux concepts et nouvelles solidarités*. 11.

Igwe, P. A., Lock, D., & Rugara, D. G. (2022). What factors determine the development of employability skills in Nigerian higher education? *Innovations in Education and Teaching International*, 59(3), 337–348. <https://doi.org/10.1080/14703297.2020.1850319>

Labbé, S., Marengo, N., Gojard, L., & Bourlot-Ranty, S. (2019). Le regard des formés sur les compétences transversales : Outils de connaissance et de re-connaissance. *Recherches en éducation*, 37, Article 37. <https://doi.org/10.4000/ree.817>

Lemaître, D. (2009). Le curriculum des grandes écoles en France : Un modèle d'analyse inspiré de Basil Bernstein. *Revue française de pédagogie. Recherches en éducation*, 166, 17-26. <https://doi.org/10.4000/rfp.1096>

Morlaix, S., & Nohu, N. (2019). Compétences transversales et employabilité : De l'université au marché du travail. *Éducation Permanente*, 218(1), 109-118. <https://doi.org/10.3917/edpe.218.0109>

Mwita, K., Kinunda, S., Obwolo, S., & Mwilongo, N. (2023). Soft skills development in higher education institutions: Students' perceived role of universities and students' self-initiatives in bridging the soft skills gap. *International Journal of Research in Business and Social Sciences* (2147–4478), 12(3), 505–513. <https://doi.org/10.20525/ijrbs.v12i3.2435>

Naga, N. (2023). University-company collaboration: what are the obstacles in Algeria?. *SocioEconomic Challenges*, 7(1), 59-64.

Sá, M., & Serpa, S. (2018). Transversal competences: Their importance and learning processes by higher education students. *Education Sciences*, 8(3), Article 126. <https://doi.org/10.3390/educsci8030126>

Tardif, J., & Dubois, B. (2013). De la nature des compétences transversales jusqu'à leur évaluation : Une course à obstacles, souvent infranchissables. *Revue française de linguistique appliquée*, XVIII(1), 29-45. <https://doi.org/10.3917/rfla.181.0029>

Young, M. (1971). Young, Michael F. D., ed., *Knowledge and Control : New Directions for the Sociology of Education* . London: Collier-Macmillan, 1971. *CIRS: Curriculum Inquiry and Related Studies from Educational Research: A Searchable Bibliography of Selected Studies*. <https://stars.library.ucf.edu/cirs/1272>