

The Use of Physical Terminology in the School Textbook as Presented in the Unified dictionary and the School Guide: A Comparative Study

Dr Fatiha Abida

University of Algiers 2 - Abou EL Kacem Saâdallah - Algeria

Email: fatiha.abida@univ-alger2.dz

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Abstract

The world has witnessed rapid developments in science and technology, bringing with them a large number of terms denoting scientific and technical concepts that are understood only by specialists. For Arab countries to acquire such scientific and technical knowledge, linguists and specialists, whether as individuals or as scientific bodies, endeavour to establish appropriate Arabic equivalents for the scientific concepts entering their languages and to standardise them across the Arab world. Among these bodies, two may be mentioned in particular: the Bureau for the Coordination of Arabisation and the Supreme Council of the Arabic Language, both of which publish dictionaries of widely used and current Arabic terminology. This study aims to examine the extent to which the authors of the fourth-year middle school textbook, *Physical and Technological Sciences*, have employed the terms in the *Unified Dictionary for Terminologies of General and Nuclear Physics* and in *A School Guide to the Terminology of Physical Sciences*.

Keywords: physical terminology; criteria for term selection, Unified Dictionary for Terminologies of General and Nuclear Physics ; A School Guide to the Terminology of Physical Sciences; terminological synonymy.

Introduction

Terms convey precise scientific concepts upon which the various branches of knowledge and sciences are founded. Specialists use them, and pupils rely on them to understand the various scientific phenomena encountered in classroom studies and to acquire a body of scientific knowledge that contributes to improving their academic performance. In view of this importance, we considered it appropriate to examine the terminology of one of the sciences, namely, physics, at the intermediate stage of education to raise the following question: To what extent have the authors of the school textbook employed the terms contained in two dictionaries, namely, the *Unified dictionary for Terminologies of General and Nuclear Physics* (English–French–Arabic), issued by the Bureau for the Coordination of Arabisation, affiliated with the Arab League Educational, Cultural and Scientific Organisation, and the *School Guide to the Terminology of Physical Sciences*, issued by the Supreme Council of the Arabic Language? Furthermore, which of the two contains terms that were more widely used, given that the first scientific body seeks to unify terminology through the publication of unified dictionaries in the various sciences, directed to those concerned with the matter among teachers, students, researchers, and translators throughout the Arab world, while the second body works to prepare the school guide for reference in the fields of teaching, learning, and school textbook writing, bearing in mind that the authors of the *Unified dictionary for Terminologies Physics* and the school guide adopted fundamental principles in the selection of scientific terms, which we

identify in the course of this study. We adopt descriptive, analytical, and comparative methods appropriate for the subject of the study. Before addressing this topic, however, we first consider this concept.

1. The Concept of the Term

The word (*term*) is a deverbal noun derived from the verb meaning *to agree upon a term*, from the root denoting rectitude and soundness. “Rectitude is the opposite of corruption. A man may be righteous in himself, reforming in himself, and reforming in his deeds and affairs. Reconciliation is the making of peace among people. In addition, to do good to a beast is to treat it kindly”;¹ moreover, “reconciliation means peace. They agreed, made peace, reconciled, and became reconciled, all with one meaning. A reconciled people are those who have made peace, as although the verbal noun described them.”² Thus, the meaning of the verbs and verbal nouns subsumed under this root is the opposite of corruption.

The following definition of convention is given: it is “an expression denoting the agreement of a group upon naming a thing with a name transferred from its original place”, and “the transfer of a word from one lexical meaning to another on account of a relationship between them. It has also been said: convention is the agreement of a group upon assigning a word to correspond to a meaning, and it has been said: convention is the transfer of a thing from one lexical meaning to another meaning in order to clarify what is intended; and it has been said that convention is a specific expression among a specific group.”³

The preceding definitions reveal semantic convergence among themselves, for “the rectification of discord among people can only be achieved through their agreement.”⁴ The same applies to the scientific term, which is established by agreement among specialists in a given field to denote a scientific concept appropriate to that field, to achieve precision and communication among researchers and experts and to enable learners to assimilate scientific knowledge. One of the conditions for establishing a term is the existence of a correspondence between the lexical meaning of the word and its terminological meaning. This is a process shared by two parties, namely, linguistic researchers and specialists in the various sciences, to eliminate terminological disorder in research and translation; by this is meant the multiplicity of terms for a single concept and the overlap of terms. The efforts of individuals and groups have intensified to unify terminology. Two scientific bodies that constitute the focus of this study should be mentioned. The first is the Bureau for the Coordination of Arabisation, one whose function is “to coordinate the efforts made to enrich the Arabic language with modern terminology and to unify scientific and civilisational terminology in the Arab world.”⁵

¹ Abu Abd al-Rahman al-Khalil ibn Ahmad al-Farahidi, *Kitab al-'Ayn*, ed. Mahdi al-Makhzumi and Ibrahim al-Samarra'i, *Silsilat al-Ma'ajim wa-al-Faharis*, vol. 3, 117.

² Muhammad ibn al-Mukarram ibn Abi al-Hasan al-Ansari al-Khazraji, *Lisan al-'Arab* (Cairo: Dar al-Ma'arif), 1:2479.

³ Ali ibn Muhammad al-Sharif al-Jurjani, *Kitab al-Ta'rifat*, ed. and study by Muhammad Sadiq al-Minshawi (Cairo: Dar al-Fadilah), 27.

⁴ Mahmud Fahmi al-Hijazi, *al-Usus al-Lughawiyah li-'Ilm al-Mustalah* (Cairo: Dar Gharib li-al-Tiba'ah wa-al-Nashr wa-al-Tawzi', 2008), 7.

⁵ *Dalil Maktab Tansiq al-Ta'rib* (Rabat: Arab League Educational, Cultural and Scientific Organisation), 7.

The second is the Supreme Council of the Arabic Language, which has issued numerous guides, including the *School Guide to the Terminology of Physical Sciences*. These two bodies are introduced below.

2. Introduction to the Unified dictionary for Terminologies of General and Nuclear physics

Physics

2.1. Origin of the Glossary

This is a dictionary compiled by the Bureau for the Coordination of Arabisation, affiliated with the Arab League Educational, Cultural and Scientific Organisation, and it comprises three dictionaries:

"dictionary of Physics Terminology (in General Education)" was approved at the Second Arabisation Conference held in Algiers in 1973.

dictionary of General Physics Terminology: approved at the Fifth Arabisation Conference held in Amman from 21 to 25 September 1985.⁶

dictionary of Nuclear Physics Terminology: approved at the Fifth Arabisation Conference held in Amman from 21 to 25 September 1985."

The terms contained in this glossary were arranged alphabetically in English. They are numbered and accompanied by French and Arabic equivalents and include two indexes, one in Arabic and the other in French, likewise arranged alphabetically, with the numbering of the terms in them corresponding to the order given in English.

Among the symbols used in the glossary are the following:

, : indicates separation between synonyms in a foreign language.

(n) indicates terms related to nuclear physics.

1

2

3: indicate the numbering of terms in cases where the basic term has multiple concepts.

/ : indicates separation between two shared adjectives that refer to the same noun.

() : contain certain explanations or definitions.

⁶ Bureau for the Coordination of Arabisation, *al-Mu'jam al-Muwahhad li-Mustalahat al-Fizya' al-'Ammah wa-al-Nawawiyyah* (Tunis: Arab League Educational, Cultural and Scientific Organisation, 1989), 9–10.

_ indicates a preference for the first Arabic equivalent when there is more than one Arabic equivalent.⁷

2.2. Method adopted by the Bureau for the Coordination of Arabisation in Preparing the Unified dictionary of Terminology

The Bureau for the Coordination of Arabisation sought to resolve the problem of terminological disorder from which linguists, translators, and educational institutions in Arab countries suffer at all levels by preparing specialised dictionaries with the aim of unifying terminology, following a rigorous methodology consisting of involving specialised scientific bodies in the formulation of terms through the following steps:

- contacting all Arab countries and their scientific and educational institutions to provide the Bureau with the terms they possess in English and French, together with the Arabic equivalents available to them;
- extracting the terms in actual use from higher education textbooks;
- organising the terminological material collected by the Bureau into trilingual⁸ lists in English, French, and Arabic to keep pace with rapid technological development in all scientific fields, which is effectively manifested in the teaching of scientific subjects in educational institutions at various stages of education, including the intermediate stage, where we shall examine the physics terminology of the fourth year of intermediate education. What, then, are the contents of the latter?

3. The School Guide to the Terminology of Physical Sciences

3.1. Origin of the dictionary

In 2012, the Supreme Council of the Arabic Language published a glossary prepared by a group of researchers from several specialisations, as well as practitioners in the education sector. It contained terms from physics and chemistry and was intended for teachers and pupils at the intermediate and secondary stages of education, as well as for school textbook authors. In the introduction to the dictionary, reference was given to the nature of the selected terms, which consisted of “the basic terms in use, in addition to the new terms that appeared in the curricula of educational system reform, as well as terms occurring in certain dictionaries published in Arab countries, among which may be mentioned in particular the unified dictionaries of terminology in physics, chemistry, and biology.”⁹ Among the distinguishing features of this glossary are the inclusion of illustrative images and the use of colours both in the images and in the writing of the terms. The guide comprises two dictionaries: one of physical terms and one of chemical terms. Its terms are arranged alphabetically in Arabic, marked in green, followed by French equivalents in black and English equivalents in red, with numbering corresponding to the French–English index.

⁷ See Bureau for the Coordination of Arabisation, *al-Mu‘jam al-Muwahhad li-Mustalahat al-Fizya’ al-‘Ammah wa-al-Nawawiyah*, 13.

⁸ *Ibid.*, 10.

⁹ Supreme Council of the Arabic Language, *Dalil Madrasi fi Mustalahat al-‘Ulum al-Fizya’iyyah: Mu‘jam ‘Arabi–Injlizi–Faransi*.

The first dictionary was followed by short biographical notices of distinguished physicists, accompanied by their photographs and brief accounts of their most famous works, spread across five pages. The second glossary was followed by appendices recording the names of certain chemists across four pages, followed in turn by pages containing the following headings: nomenclature in organic chemistry; molar ionic conductivity of certain ions; colour indicators; certain quantities and their units; constants and numerical values; symbols; multiples and submultiples of units; and, finally, a French–English index.

2.3. Objectives of the School Guide

Every dictionary has objectives that it seeks to achieve. The objectives of the school guide are as follows:

- “to unify scientific terminology at the intermediate and secondary levels of education as a preliminary step towards its unification at the university level and throughout the Arab world; (...)
- to reduce the number of scientific terms in circulation, in view of the multiplicity of synonyms resulting from the diversity of Arab scientific missions to Algeria;
- to produce specialised guides in the physical sciences (physics and chemistry) consistent with the specifications of scientific dictionaries.”¹⁰

3.3. The Fundamental Principles Followed in the Selection of Physical Terms in the School Guide

The authors of the school guide established fundamental principles that guided their selection of physical terms appropriate to the needs of learners at the intermediate and secondary stages. These are as follows:

- the necessity of correspondence between the lexical meaning of the term and its scientific meaning;
- the assignment of a single term to every single scientific concept with a single content;
- the avoidance of multiple meanings for the same term within the same field and the preference for the specialised expression over the shared expression;
- consideration for bringing Arabic and international terms closer together to facilitate equivalence between them;
- preference for Arabic words over Arabicised words;
- preference for the single word over the compound expression;
- preference for the precise word over the general or ambiguous word;
- preference for the common word over the rare or strange word, unless the scientific term is confused with the common current meaning of that word;
- consideration for the terms and meanings on whose use specialists have agreed, whether arabicised or translated.¹¹

¹⁰ *Dalil Madrasi fi Mustalahat al-‘Ulum al-Fizya’iyyah*, introduction.

¹¹ *Ibid.*

4. Presentation of the Textbook *Physical Sciences and Technology* for the Fourth Year of Intermediate Education

In 2019, a group of teachers authored a textbook entitled *Physical Sciences and Technology*, intended for pupils in the final year of intermediate education. In it, they sought to reinforce pupils' prior learning in the physical sciences and to provide them with new knowledge and acquisitions, in order to achieve scientific competences in "matter and methodological competences: the methodology of scientific thinking and problem-solving, mastery of certain basic concepts in physics and chemistry, management of a technological project, and the use of information and communication technology in various fields, etc."¹² The book addresses four fields, each of which contains different topics encompassing the phenomena and concepts studied by the pupil, as follows:

4.1. The Field of Electrical Phenomena

This field concerns electrification phenomena, including concepts such as electric charge, alternating electric current, and electrical safety.

4.2. The Field of Matter and Its Transformations

This field involves learning the structure of matter, namely, the molecule, the atom, and, finally, the ion. The following topics are addressed: ionic solutions, simple electrolysis, and chemical reactions and their equations.

4.3. The Field of Mechanical Phenomena

This field addresses the concepts of the mechanical system and force, followed by two examples of weight and Archimedes' upthrust, together with applications to the study of equilibrium in the case of the action of two forces and in the case of the action of three nonparallel forces.

4.4. The Field of Optical Phenomena

This field addresses the concepts of vision through the light-ray model, the image, reflection, and its applications to plane mirrors.¹³

¹² Ministry of National Education, *al-'Ulum al-Fizya'iyyah wa-al-Tiknulujiya li-al-Sanah al-Rabi'ah min al-Ta'lim al-Mutawassit* (2019), authors: Habbani Khalifah, Ait Oudia Malika, Makahliya Sumayya, Ben Batqa al-Mahdi, and Belaziz Mukhtar.

¹³ Bureau for the Coordination of Arabisation, *al-Mu'jam al-Muwahhad li-Mustalahat al-Fizya' al-'Ammah wa-al-Nawawiyyah*, 4.

The authors devoted a page entitled *Discover My Book*, in which they set out the stages for carrying out each topic, as follows: entering the field,¹⁴ activities,¹⁵ deriving and retaining the essentials,¹⁶ exercises,¹⁷ the methodological sheet,¹⁸ and reading and research.¹⁹

The book also included coloured illustrations of electrical, mechanical, and optical phenomena, as well as experimental apparatuses. It concludes with definitions of thirty terms accompanied only by French equivalents, arranged alphabetically.

5. The Use in the School Textbook of Physics Terms Contained in the Unified Glossary of Physics Terminology

We traced a random sample of 344 physics terms, both simple and compound, from the fourth-year intermediate education textbook *Physical Sciences and Technology* and from the *Unified Glossary of General and Nuclear Physics Terminology* to determine the extent to which the authors of the school textbook employed the terms recorded in the unified glossary. We identified three cases, namely:

- correspondence between the terms in the school textbook and the unified glossary;
- divergence between the school textbook and the unified glossary in terms of terminology;
- absence from the unified glossary of terms occurring in the school textbook.

Each of these cases is illustrated with examples below.

5.1. Correspondence between the Terms in the School Textbook and the Unified Dictionary

The authors of the school dictionary and the *Unified Dictionary of Physics Terminology* agreed to record 141 physics terms, representing 40.98% of the selected sample of 344 terms.

Notably, both glossaries include two terms for a single concept, although this is a small number compared with the predominance of a single term. The two cases are described below.

5.1.1 Terminological Synonymy in the School Textbook and the Unified Dictionary

The number of terms, both simple and compound, occurring as single terms in the school textbook reached 338 out of the total sample of 344 terms. The unified dictionary contained 170

¹⁴ It begins with a problem from daily life, for which an answer is provided upon completing the field of study, along with a set of simple situations.

¹⁵ These are types of learning situations, predominantly experimental in character, allowing for gradual learning and continuous training in following methodological procedures.

¹⁶ It contains certain elements of the answers relating to the activities, followed by the most important theoretical and experimental knowledge addressed in each part of the section. This element is followed by a table listing several physical and chemical terms with their French and English equivalents, ranging from 4 to 5, 6, and 8 at others, for a total of 62 terms.

¹⁷ These require the pupil to recall the lesson's concepts and apply them; some also allow for deeper reflection and encourage research and inquiry. The solutions are provided at the end of the book.

¹⁸ The pupil may return to them in order to develop experimental and methodological competencies; they also assist in the construction of learning.

¹⁹ It contains additional information on what the pupil has studied and, through questioning, encourages deeper research by using the internet.

single terms out of a total of 186 terms.²⁰ These figures reflect the principles adopted by the team that compiled the unified dictionary, namely, “to confine itself to a single equivalent except in cases of extreme necessity, in which only two Arabic equivalents are retained.”²¹ Examples of terms occurring with a single equivalent in the school textbook and the unified dictionary are as follows:

feed — alimentation

Plane mirror — plan miroir

electric network — réseau électrique

angle of reflection — angle de réflexion

The number of terms occurring as synonyms with two equivalents in the school textbook was limited to 6 out of the total selected sample of 344 terms, whereas 16 such terms occurred among the 186 physics terms in the unified dictionary, which are listed below.

- **School textbook:**
- dissipation (decomposition); adjustment or alignment; earthing (grounding); inclined surface (inclined plane); dividing switch (partial switch); direction (support).
- **Unified dictionary:**
- (fusion, melting); (tension, stress); (interaction, reaction); (balance, equilibrium); (rubbing, tribo); (immersion, dipping); (ion, ion); (fuse, cut-out); (space, domain); (neutral, neutral); (screw- jack, jack-screw); (capacitor, capacitance); (anode, plaque); (transference, electric power transmission); (pendulum, pendulum); (migration of ions, ion displacement).²²

5.1.2. Definitions of the Terms in the Unified Dictionary

The terms in the selected sample from the unified dictionary appeared without definitions or illustrations, except for four terms accompanied by brief explanations placed in parentheses, namely, coulomb (ampere-second) (unit of electric charge), volt (unit for measuring electric potential), ampere (unit of electric current), and newton (unit of force).

5.2. Divergence of Physics Terminology between the School Textbook and the Unified Dictionary

This divergence appeared in two forms: divergence in formulation and divergence in the choice of the Arabic equivalent. It was manifested in 45 terms, representing 13.08 percent. The two forms are discussed in detail below.

5.2.1. Divergence in the Formulation of the Term

²⁰ It is the result of the sum of the corresponding and divergent terms.

²¹ Bureau for the Coordination of Arabisation, *al-Mu'jam al-Muwahhad li-Mustalahat al-Fizya' al-'Ammah wa-al-Nawawiyyah (Injilizi-Faransi-'Arabi)*, 11.

²² *Ibid.*, 125, 285, 244, 104, 293, 144, 153, 125, 271, 198, 40, 18, 291, 215, and 187.

The formulation of certain terms differed between the school textbook and the unified dictionary. Their number reached 22 terms from the sample taken from the school textbook, representing 6.39 percent, which is a small proportion in comparison with the rate of correspondence observed between the terms in the two dictionaries. Examples illustrating this divergence between the school textbook and the unified dictionary are as follows: /infra-red radiation/ (infra-red rays), (electrification by touch/electrification by contact), (electric detector/electroscope), (electrolytic solution/electrolyte), (screw-jack/jack-screw), and (alternating generator/alternator).

The terms that differed in formulation and for which a foreign equivalent was provided followed two trends. The first consisted of proceeding from the source language with a single foreign term and arriving in the target language at two different Arabic terms differing in morphological structure according to recognised Arabic patterns. By way of example, although not exclusively, the term *electroscope* was found to correspond to the term *electric detector* in the school textbook, following the pattern of the active participle, and to *electroscope* in the unified dictionary, following the instrumental pattern. This appears to be an application of the decision issued by the Arabic Language Academy concerning “foreign words ending in the suffix *-scope*: their meaning is to be examined, and if it is possible to derive from it an instrument noun according to the recognised pattern, this should be done, and the relational suffix should be added to its derivatives. If it is not possible to derive an instrument noun from the meaning, or if other difficulties prevent this, the term *scope-device* should be used together with the function of the instrument.”²³ This corresponds to the present case, in which *the electroscope* follows the instrumental pattern and is combined with the instrument's function, namely, electricity. “The generated or latent force is called electricity, and the adjectival form derived from electricity is electrical”²⁴

The second tendency was manifested in proceeding from the source language with two different foreign terms, differing in singular and plural form or in verb and verbal noun, and necessarily arriving in the target language at two different Arabic equivalents. This is exemplified by the French terms *rayons infrarouges*, used in the school textbook's small glossary at the end of the book, and “*rayonnement infra-rouge*”, appearing in the unified glossary. The first corresponds to the term “*infrared rays*”, whereas the second corresponds to the term “*infra-red radiation*”. In addition, the terms *flottement* and *flottaison* appeared as verbal nouns, whereas *flotte* appeared in the verbal form. The first was rendered by the term *floating*, whereas the term *floats* rendered the second.

5.2.2. Divergence in the Choice of Arabic Equivalent

The school textbook differed from the unified dictionary in 23 terms; that is, it differed by 6.68%. Among these are:

(accumulator/battery), (diffraction grid/diffraction grating), (angle of fall/ angle of incidence), (positive ion/positive ion), (estimated image/virtual image), (switch/commutator), (ion displacement/ migration of ions/ ionic migration).

²³ Arabic Language Academy, *Majmu'at al-Qararat al-'Ilmiyyah fi Khamsin 'Aman*, ed. Muhammad Shawqi Amin and Ibrahim al-Tarzi (Cairo: General Authority for Amiri Press Affairs, 1984), 180.

²⁴ *Ibid.*, 191.

One reason for the divergence between the school textbook and the unified dictionary in terms is their differing methods of term formation: the former uses borrowed words, whereas the latter uses derivations based on Arabic morphological patterns. The clearest two examples of these two cases are the term *dynamo électrique*, which was translated as *dynamo* in the school textbook and as the compound term *electric generator* in the unified dictionary, bearing in mind that the Arabic word is preferred to the borrowed and arabicised form unless the latter is well known.

The same applies to the compound term *ion positif*, which is translated into two terms, namely, *positive ion* in the school textbook and *positive ion* in the unified dictionary.

The school textbook and the unified glossary also differed in their choice of the common Arabic term for *métal*, which was rendered as two different Arabic equivalents: the school textbook used *elemental metal*, whereas the unified dictionary used *metal*. The same applies to the compound term *réseau de diffraction*, which we found to be rendered by two different equivalents: *diffraction grid* in the school textbook and a *diffraction grating* in the unified dictionary.

We also observed a difference in the adoption of certain morphological forms to denote the concept of the term, as occurs with the active participle form, which conveys continuity of the action, and the instrumental pattern in instrument nouns, which conveys the meaning of detection, as illustrated by the term *oscilloscope*, which was rendered as a *cathode-ray vibration recorder* in the school textbook and as an *oscilloscope* in the unified dictionary. The authors of the latter were careful to “ensure the correctness of the linguistic form of the Arabic term so that it may be integrated into the Arabic lexicon and to ensure that the form of the Arabic term reflects the scientific meaning of the foreign term rather than being a literal translation of it.”²⁵

5.3. Absence of the School Textbook Terms from the Unified Dictionary

A total of 158 terms were absent from the unified dictionary, representing 45.93 percent, which is a considerable proportion. Their absence may be attributed to the fact that each of the two works mentioned above relied on the terminology current within its own scholarly milieu. Most of the absent terms are compound terms, as illustrated by the following examples: transition, effect, partial immersion, jack, cone of vision, vertical plane, principle of reciprocal action, electric stings, reflecting mirror, and system of thermal exchanges.

6. The Use in the School Textbook of Physics Terms Contained in the School Guide

We retained the same sample selected from the school textbook, numbering 344 terms, which had been used in the survey of the unified dictionary, and traced it in the *School Guide to the Terminology of Physical Sciences* to determine the extent to which the authors of the school textbook employed the terms recorded in the school guide. We found the same cases as those identified when the school textbook was compared with the unified dictionary, although with different percentages. These are as follows:

- correspondence between the terms in the school textbook and the school guide;
- divergence between the school textbook and the school guide in terms of terminology;

²⁵ Bureau for the Coordination of Arabisation, *al-Mu'jam al-Muwahhad li-Mustalahat al-Fizya' al-'Ammah wa-al-Nawawiyyah*, 11.

- absence from the school guide of terms occurring in the school textbook.

6.1. Correspondence between the Terms in the School Textbook and the School Guide

A total of 229 physics terms achieved complete correspondence between the school textbook and the school guide, representing 66.56% of the selected sample. In the school guide, these appeared with French and English equivalents, and some of them occurred as synonyms, as illustrated below.

6.1.1. Terminological Synonymy

The school textbook and the school guide contained predominantly single terms. Their total reached 339 terms in the pupil's textbook and 228 in the school guide, out of a total of 246 physics terms. This accords with the principle adopted by the team that compiled the school guide, namely, “to assign a single term to every single scientific concept with a single content”. The following are examples of terms occurring singly together with their French and English equivalents:

transition (*transition/transition*); spring (*ressort/spring*); mechanical system (*système mécanique/mechanical system*); electric diagram (*schéma électrique /electric diagram*).

We also found 18 terms with two synonyms out of the total of 246 physics terms in the school guide, namely:

(ammeter, ampere meter), (effect, result), (earthing, grounding), (dissipation, dispersion), (reaction, interaction), (balance, equilibrium), (magnetic field, magnetic domain), (short circuit, shortened circuit), (ion, ion), (cathion, positive ion), (negative ion, negative ion), (electric shock, electric shock), (distillate, dropper), (jack, socket), (electrolyte, electrolyte), (solute, dissolved substance), (lamp, lantern), (fuse, melted).²⁶

6.1.2. Definitions of the Terms in the School Guide

Most of the physics terms in the school guide lacked definitions; only a small number were defined, while the remaining terms were presented solely as images or diagrams without definition. The following examples illustrate each of these cases:

- **The first case** consisted of the absence of both definitions and illustrations. This was the predominant case, accounting for 168 of the 246 terms, or 68.29 percent. Examples include dissipation, beam of light, orbital speed, cohesive force, energy levels diagram, and electromagnetic theory.²⁷
- **The second case** consisted of the definition of terms. Their number was small, amounting to 64 terms, which represents 26.01%. Examples include additive synthesis, mechanical tension, and an electric circuit.²⁸ Their definitions are as follows:
 - **Additive synthesis:** a model for the synthesis of light based on the following rules:
 - The sum of two primary lights produces a secondary light.

²⁶ See the following pages: 21, 28, 29, 35, 39, 49, 52, 62, 62, 65, 179, 189, 192, 101, and 77.

²⁷ See pages 29, 48, 60, 83, 96, and 115.

²⁸ See pages 32, 40, and 52.

- Each secondary light has a primary light that complements it.
- The sum of two complementary lights produces white light.
- The absence of light signifies the color black.
- **Mechanical tension:** the force applied to a spring or a rope; its unit is the newton (N).
- **Electric circuit:** a closed set of conductors and electrical elements connected in series and/or in parallel. To represent it, symbols are used for its various elements.

Notably, three terms in the selected sample were defined and illustrated at the same time, namely, reflected ray, voltmeter, and magnet.²⁹

- **The third case** consisted of terms followed by images of technical devices, drawings, and figures. Their number reached 14 terms, that is, 5.69%, namely, hoist, pulley, sinusoidal electric voltage, triangular alternative voltage, square voltage, photovoltaic cell, lever, diffraction grating, switch, magnet bar, total eclipse, inclined plane, fuse, and spring.³⁰

6.2. Divergence in Terminology between the School Textbook and the School Guide

This divergence appeared in two forms: divergence in the formulation of the term and in the choice of the Arabic equivalent. It was manifested in 17 terms, representing 4.94 percent. The following presents these two forms with examples.

6.2.1. Divergence in the Formulation of the Term

Certain terms were formulated differently in the school textbook and the school guide. Their number reached 12 terms, which is equivalent to 3.48%. This divergence may be illustrated through the following examples:

(atomic diameter/atomic diameter), (magnetic rod/ magnetic bar), (maximum value of electric voltage/maximum permissible limiting value), (sinusoidal voltage/ alternating sinusoidal electric voltage), (increase in load/overload), (mass of the atom/atomic mass), (electric conductor/conductor of electricity).

The results of the comparison between the school textbook and the school guide regarding terms differing in formulation did not differ from those obtained in the comparison between the school textbook and the unified dictionary, since the forms of divergence manifested in two tendencies. It is worth recalling them by providing further examples that support what has been stated. The first tendency consisted of proceeding from a single foreign term and arriving at a divergence in the structure of the corresponding Arabic term, as in the case of *surcharge*, which we found to correspond to an *increase in load* in the pupil's textbook and *overload* in the school guide. The second tendency consisted of proceeding from two different foreign terms, differing in singular and plural form, and arriving at two different Arabic equivalents. This is represented

²⁹ See pages 63, 79, and 103. The school guide also contains other terms.

³⁰ See pages 26, 27, 40, 40, 40, 51, 56, 62, 80, 82, 87, 99, 77, and 113.

by the same term cited when discussing the unified dictionary, namely, *infrared rays*,³¹ used in the school textbook, and the term “infrared radiation” occurs in the school guide.

6.2.2. Divergence in the Choice of the Arabic Equivalent of the Term

Five physics terms displayed divergence in their Arabic equivalents between the school textbook and the school guide, representing 1.45 percent. Among these terms is *plaque photovoltaïque*, which we found with two Arabic equivalents: a *photovoltaic plate* and a *photovoltaic panel*. The first equivalent occurred in the school textbook in the following passage: “Recently, solar cells in *photovoltaic plates* have begun to be used for the production of electricity in places to which electricity from the power grid is difficult to supply because of their isolation or because of the high cost of connecting them to the grid.”³² The second equivalent, by contrast, occurred in the school guide without a definition.³³

The second term is *lampe à incandescence*, which the school textbook rendered as an a *glow lamp*, whereas the school guide rendered it as a *ncandescent lamp*. The former is the more widely used term since the Arabic Language Academy in Cairo used the term *incandescent lamp*: “an evacuated electric lamp containing a metallic filament that emits light when the filament is heated to incandescence as a result of an electric current passing through it.”³⁴ The Arabic Language Academy in Damascus likewise used it: “a lamp that emits light by heating its filament electrically to a high temperature.”³⁵

We found the root denoting *glow* used in the *Dictionary of Contemporary Arabic* in its physical sense under the symbol indicating physics, where it was defined as “thermal radiation emitted from a body after it has been heated to a high temperature; glow may occur in a solid, a liquid, or a gas.”³⁶ This indicates that the term *glow* is widely used and common because the dictionary records terminology from the sciences and arts that has achieved circulation and widespread use, thereby ceasing to be confined to specialists. It should be borne in mind that the selection of terms must take into account those terms and meanings whose use specialists have agreed upon, whether arabicised or translated.

6.3. Absence of the School Textbook Terms from the School Guide

The number of school textbook terms absent from the *School Guide to the Terminology of Physical Sciences* reached 98 out of a total of 344 terms, representing 28.48 percent. Most of the absent terms are compound terms, as illustrated by the following examples: insulating layer, stationary coil, electric lamp socket, dividing switch, modelling equation, and the principle of the vector of Archimedes’ upthrust. The reason for their absence is that each author used the terms of which he was convinced within his own scholarly milieu, given that the authors of the school guide seek “to select the most suitable term from among the terms used by teachers and occurring in school textbooks, and not to resort to the creation of new terms except in cases

³¹ See page 10 of this article.

³² Ministry of National Education, *al-‘Ulum al-Fizya’iyyah wa-al-Tiknulujiya*, 103.

³³ Supreme Council of the Arabic Language, *Dalil Madrasi fi Mustalahat al-‘Ulum al-Fizya’iyyah*, 91.

³⁴ Arabic Language Academy in Cairo, *Mu‘jam al-Fizya’*, 461.

³⁵ Arabic Language Academy in Damascus, *Mu‘jam Mustalahat al-Fizya’* (Syria: Publications of the Arabic Language Academy in Damascus), 228.

³⁶ Ahmad Mukhtar Umar, *Mu‘jam al-Lughah al-‘Arabiyyah al-Mu‘asirah*, 1st ed. (Cairo: ‘Alam al-Kutub, 2008), 2501.

where the term does not convey the scientific meaning or is not linguistically sound.”³⁷ It is therefore necessary to unify the physics terminology used in the school environment by referring back to the guide.

7. Comparison between the Use of the Unified dictionary Terms and the School Guide Terms in the School Textbooks

After establishing, on the one hand, the proportion of the use of the terms of the unified dictionary in the school textbook within the selected sample and, on the other hand, the proportion of the use of the terms of the school guide in the school textbook, we compared the two proportions to determine which of the two dictionaries had terms more frequently used in the school textbook. This was accomplished by comparing the three previously identified cases as follows:

7.1. The Case of Correspondence between the Terms of the School Textbook and Those of the Unified dictionary and the School Guide

Compared with the unified dictionary, the pupil's textbook made greater use of the school guide's terms. The number of terms corresponding to the pupil's textbook and the school guide reached 229 out of a total of 344, that is, 66.56%, whereas the number of terms corresponding to those of the unified dictionary reached 141, which is equivalent to 40.98%. This finding indicates that the authors of the pupil's textbook relied considerably on the terms of the school guide, especially when it is known that the Supreme Council of the Arabic Language sent one copy of the guide to the National Institute for Research in Education at El Achour and another copy to the Ministry of Higher Education. This means that the school guide was placed at the disposal of school textbook authors, teachers, and learners so that they might draw upon its terminology, with a view to eliminating terminological problems and achieving the unification of physics terminology. In contrast, copies of the *Unified dictionary of Physics Terminology*, such as the unified dictionaries issued by the Bureau for the Coordination of Arabisation in the various sciences, require firm measures to ensure that they reach those concerned so that they may benefit from them at all stages of education.

Both the unified dictionary and the school guide sought to establish a single Arabic equivalent for each foreign term to achieve terminological univocity. This was reflected in the school textbook and the school guide, as the number of synonymous terms with two equivalents in the unified dictionary was limited to 16. In contrast, in the school guide, it reached 18 terms, a slight difference that reflects the authors' concern with applying the principle of a single Arabic equivalent for each term. Examples of dual equivalents include (interaction, reaction), (balance, equilibrium), respectively.

7.2. The Case of Divergence between the Terms of the School Textbook and Those of the Unified Glossary and the School Guide

Compared with the school guide, the unified dictionary displayed a much greater degree of divergence from the school textbook in terms of the Arabic equivalents selected by nearly threefold: it recorded 45 terms (13.08 percent), whereas the school guide recorded 17 terms (4.94 percent). As previously observed, this divergence manifested in two tendencies: divergence in the formulation of the term and divergence in the equivalent itself. In the unified

³⁷ Supreme Council of the Arabic Language, *Dalil Madrasi fi Mustalahat al-'Ulum al-Fizya'iyyah*, introduction.

dictionary, the shares of these two tendencies were almost equal, with 22 cases of divergence in formulation and 23 in the equivalent. In the school guide, by contrast, the number of terms differing in formulation, estimated at 12, exceeded the number differing in the equivalent, which was 5. These results support what we stated earlier regarding the correspondence between the school textbook and the school guide.

7.3. Absence of the School Textbook Terms from the Unified dictionary and the School Guide

The absence of school textbook terms was greater in the unified dictionary than in the school guide. The number of terms absent from the unified dictionary reached 158, representing 45.93 percent, whereas their number in the school guide reached 98, representing 28.48 percent. This may be attributed to the fact that the *Unified dictionary for Terminologies of General and Nuclear Physics* did not reach educational institutions in Algeria, as it remained confined to library shelves, such as the unified dictionaries issued by the Bureau for the Coordination of Arabisation. Its terminology thus did not reach authors, teachers, or learners at all stages of their education, from intermediate schooling to university education. Consequently, the aim behind the compilation of the dictionary, namely, the unification of physics terminology throughout the Arab countries, was not achieved, as expressed by the director general of the organisation in the following statement: “In issuing these twelve glossaries in succession, the Arab League Educational, Cultural and Scientific Organisation hopes that its work will constitute a useful contribution to the Arabisation of the various sciences and technologies and that those concerned with the matter teachers, students, authors, researchers, and translators will find in them benefit and advantage and that these dictionaries will serve as a building block in the educational and scientific edifice within the context of contemporary cultural civilisation.”³⁸ This is in accordance with the principle of preferring the common term to the rare or unfamiliar one.

Conclusion

The study yielded the following results:

- Physics terminology varies between simple and compound forms.
- Tracing physics terms in the unified dictionary yielded the following cases:
 1. the case of complete correspondence between the terms of the school textbook and the unified dictionary;
 2. The case of divergence between the terms of the school textbook and the unified dictionary manifests in two forms: divergence in formulation and divergence in the Arabic equivalent.
 3. The case of the absence of school textbook terms from the unified dictionary.
- The treatment of term definitions appeared in three cases:
 1. terms lacking both definitions and illustrations, which was the predominant case;
 2. defined terms;
 3. terms presented with illustrations of technical devices, drawings, and figures.

³⁸ Bureau for the Coordination of Arabisation, *al-Mu'jam al-Muwahhad li-Mustalahat al-Fizya' al-'Ammah wa-al-Nawawiyyah*, 12.

- Tracing physics terms in the school guide likewise yielded three cases:
 1. correspondence between the terms in the school textbook and the school guide;
 2. divergence between the school textbook and the school guide in terms of terminology;
 3. absence of the pupil's textbook terms from the school guide.
- Both the unified dictionary and the school guide sought to establish an Arabic equivalent for every foreign term to secure the univocity of terminological meaning, and this was realised in both dictionaries, albeit with slight variations between them.
- The school textbook drew more heavily on the terms of the school guide than on those of the unified dictionary because the unified dictionaries issued by the Bureau for the Coordination of Arabisation do not reach educational institutions; consequently, the agreed-upon terminology is not used and remains confined to shelves.
- The unified dictionary of physics terminology showed far greater divergence from the school textbook in terms of the Arabic equivalents selected, by nearly threefold in comparison with the school guide. This divergence manifested in two forms: divergence in the formulation of the term and divergence in the equivalent.

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