



## The conceptualisation of science terminology: A cognitive linguistic analysis of the categories electricity and light in Arabic

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### Abstract

The present article focuses on the conceptual structures of two Arabic words which are used in both everyday life and science: *كهرتباة* (kahrabā') (electricity) and *ضوء* (daw') (light). Under a cognitive linguistics approach, the polysemy of these terms, revealed in the citations extracted from *ArabiCorpus*, is studied. More specifically, the analysis of the terms involves the polysemy or 'radial category' along with its prototypical and peripheral meanings, and the main factors in projecting the idealised cognitive models (ICMs) where the radial categories are formed: conceptual metaphor and conceptual metonymy. The results indicate that power and knowledge motivate the conceptualisations that underpin the categories *كهرتباة* (kahrabā') (electricity) and *ضوء* (daw') (light) respectively. Using such non-scientific conception in understanding the scientific senses of these terms leads to students' confusion and failure to understand them. To ensure that students construe the scientific concepts correctly, they must be mindful of the inconsistency between their non-scientific and scientific meanings.

**Keywords:** conceptualisation, polysemy, prototype, idealised cognitive models, conceptual metonymy, conceptual metaphor

### 1. Introduction

Several studies on students' misconception of scientific terminology have been done. They have demonstrated that this issue arises from the wide gap between non-scientific and scientific world views and between non-Western languages and Western languages. Students may construe scientific concepts like nature, observation, temperature and weight according to their preconceived ideas which completely differ from scientific notions (e.g., Kawasaki 1996; Aikenhead and Ogawa 2007; Ho-Abdullah and Hashim 2009; Lahlou and Hajar 2013; Lahlou and Hajar, 2016) [13, 1, 9, 15, 16].

This paper is an analysis of two major Arabic words that not only form part of scientific terminology but everyday language as well. The polysemy of the lexical items *كهرتباة* (kahrabā') (electricity) and *ضوء* (daw') (light) [1] is examined, using a cognitive approach to show how speakers of Arabic conceptualise these concepts. More precisely, the polysemy of the concepts concerned is investigated to identify the prototype effects in their semantic networks and to explore the cognitive mechanisms (conceptual metaphor and conceptual metonymy) that motivate their sense expansion.

### 2. Methodology

The theoretical framework used in this paper consists of idealised cognitive models (ICMs) to examine the conceptual structures of the terms under study (Lakoff & Johnson, 1980/2003; Lakoff, 1987) [18, 17]. The prototype theory (Rosch,

1973; 1975) [20, 21] is employed to identify the most prototypical meanings of the terms. Conceptual metaphor and conceptual metonymy (Lakoff & Johnson, 1980/2003) [18] were also used to spot the main cognitive mechanisms which motivate the meaning extensions of the terms concerned.

To identify the senses and instances of *كهرتباة* (kahrabā') (electricity) and *ضوء* (daw') (light), the *ArabiCorpus* (Arabic Corpus Search Tool) (173 million, 6 hundred thousand words) is employed. Bowker and Pearson (2002) [3] assert that corpora can help in exploring the various senses of a word by means of the up-to-date real examples of language they provide. The corpus is also used to search for the most frequent collocates of the terms. Corpora can be used to ascertain the frequency of occurring collocates (Bowker & Pearson, 2002) [3] which in turn facilitates detecting the most prototypical meanings of words being analysed (Geraerts, 2006) [8]. Finally, the cognitive mechanisms that motivate the semantic extensions of the linguistic terms are identified based on the examples found in the *ArabiCorpus*.

### 3. Results

In this section, the data collected on the concepts ELECTRICITY and LIGHT from *ArabiCorpus* are presented and analysed. The analysis of these concepts encompasses polysemy, that is, the result of the expansion of idealised cognitive models (ICMs), prototypical effects, and mechanisms that motivate the semantic extensions, namely conceptual metaphor and conceptual metonymy.

#### 3.1 The Polysemy and prototypical meanings of *كهرتباة* (kahrabā')

The word *كهرتباة* (kahrabā') has been selected to denote the scientific concept of Electricity in Arabic. This concept has

<sup>1</sup> In this paper, the polysemy of these two concepts involves all the meanings retrieved from the *ArabiCorpus* (Arabic Corpus Search Tool). The data extracted from the corpus do not include all the Arabic dialects. Therefore, the overlap between *كهرتباة* (kahrabā') (electricity) and *ضوء* (daw') (light) in some Arab countries like Morocco and Tunisia is not addressed. In these countries, both *electricity* and *light* are denoted by the word *ضوء* (daw').

been projected from a lexical item which has a polysemous nature, albeit simple. In accordance with *ArabiCorpus*, the word **كهرباء** (kahrabā') can be described as 'power, the public supply of electricity', 'consumption of electricity', 'source of electric lighting' or 'seizure'. Table 1 lists these meanings with examples.

**Table 1:** The Meanings and Examples of **كهرباء** (kahrabā')

Meanings	Examples
(1) 'power, the public supply of electricity' / 'power or the public supply of electricity, wiring (in domestic installation)'	...تقطع الكهرباء بشكل دائم وخاصة في أيام الأعياد والمناسبات... ...tanqaṭi'u lkahrabā' u biṣaklin dā'imin wa khāṣṣatan fi ayyāmi l'a'yādi wa lmunāsabāt...
	...electricity is always cut off, especially at festivals and occasions...
	...ويصارع جاهدا لتأمين إيجار البيت او لدفع فاتورة الكهرباء. ...wa yuṣāri'u jāhidan lita'mīni ijjāri lbayti aw lidaf'i fātūrati lkahrabā'.
(2) 'electricity (consumption)'	...لا توجد مياه للشرب ولا كهرباء للإنارة ولا ... ...أي من متطلبات الحياة العادية ...lā tujadu miyāhūn liṣṣurb wa lā kahrabā' lil'ināra wa lā ayyun min mutatalabbāt lḥayāt l'ādiya...
	...there is no drinking water, electricity for lighting or ordinary requirements of life...
	...he struggles hard to secure the house rent and to pay the electricity bill.
(3) 'source of electric lighting' / 'source of electric lighting, electrical equipment'	...البابان بدأت تشتكي من آثار تلك الألعاب لكونها تنشط كهرباء المخ مما ينتج عنه التعرض لحالات الصرع المتكرر. ... Al-Yābān bada'at taṣtakī min 'āṭār tilka al-'āb likawnihā tunaṣṣiṭu kahrabā' al-muḥ mimma yantuju 'anhu al-tta'aruḍ liḥālāt ālṣar' almutakarrir.
	... Japan started complaining from the effect of those games [electronic games] as they activate brain electricity which results in frequent cases of epilepsy.
	...
(4) 'seizure' (forming a compound with <b>المخ</b> (al-muḥ) (brain))	...
	...
	...

It is worth mentioning here that Arabic **كهرباء** overlaps with English *electricity* in the first three senses:

- Increasing water, *electricity* and gas bills are adding to production cost pressures.
- Saving energy in the home makes good environmental sense, and will save money on *electricity* and gas bills.
- One quarter of Britain's emissions of carbon dioxide are the result of *electricity* and gas use in the home, mainly for heating, lighting and cooking [2].

The fourth meaning of **كهرباء** (kahrabā')- that is, 'seizure', however, does not constitute a member of the category ELECTRICITY in English. More details on this will be given

<sup>2</sup>These examples have been taken from the *British National Corpus* (BNC).

in a later subsection. The origin of **كهرباء** (kahrabā') has been examined to explore how the meaning of **كهرباء** (kahrabā') expanded and to check whether it is significant in forming the prototypical exemplars that motivate the conceptualisation of the term.

The word **كهرباء** (kahrabā') originates from the Persian compound noun **كاه رُبا** (kah ruba), where the word **كاه** (kah) means "straw", and the word **رُبا** (ruba) denotes "attract". This compound was coined since if tree resin, or amber, is rubbed, it gets an electrostatic charge and hence attracts straw. Therefore, the original sense of **كهرباء** (kahrabā') denotes "yellow amber" given its electric attraction (Scher, 1987-1988; Lane, 1863) [22, 19]. It is worthy of note here that English *electricity* has an equivalent etymology as it is also originally associated with the notion of friction. It derives from Modern Latin *electricas*, from *electricus*, which in turn derives from Latin *electrum* (amber), from Greek *lektron*, because rubbing amber causes electrostatic phenomena (Soanes & Hawker, 2008) [23].

The central collocates, determining prototypes for **كهرباء** (kahrabā'), identified in the *ArabiCorpus* are highlighted in Table 2.

**Table 2:** The Most Prototypical Collocates of **كهرباء** (kahrabā')

Concept	Class (Words in Freq. Order)	Item	Grammatical Category	Number of Frequencies
Electricity	1 <sup>st</sup> Item	<b>ماء</b> (mā') (water)	Noun in different forms: <b>ماء</b> (mā') (singular) and <b>مياه</b> (miyāh) (plural)	3492
	2 <sup>nd</sup> Item	<b>وزارة</b> (wizāra) (ministry)	Noun with different forms: <b>وزارة</b> (wizāra) (singular), <b>وزارات</b> (wizārāt) (plural), <b>وزير</b> (wazīr) (minister) (singular), and <b>وزراء</b> (wuzarā') (ministers) (plural)	3180
	3 <sup>rd</sup> Item	<b>شركة</b> (šarika) (company)	Nouns in different forms: <b>شركة</b> (šarika) (singular) and <b>شركات</b> (šarikāt) (plural)	2511
	4 <sup>th</sup> Item	<b>محطة</b> (maḥaṭṭa) (station)	In different forms: <b>محطة</b> (maḥaṭṭa) (singular) and <b>محطات</b> (maḥaṭṭāt) (plural)	1917
	5 <sup>th</sup> Item	<b>توليد</b> (tawlīd) (generation)	In different forms: <b>توليد</b> (tawlīd) (Noun, abstract), <b>تولّد</b> (tuwallidu) (Verb) (generate), <b>مُولد</b> (muwallid) (Adjective) and <b>مُتَوَلّد</b> (mutawallid) (Adjective)	1688

The most frequent collocate of **كهرباء** (kahrabā') is water. Water, like electricity, is a pivotal utility. In this context, the typical meaning of **كهرباء** (kahrabā') is 'power'. This is further supported by all the other four frequent collocates, namely

مَحَطَّة (maḥaṭṭa) (station) and تَوْلِيد (tawlīd) (generation) as they all help in identifying the prototypical meaning of *electricity*, that is, *power*.

### 3.2 Metonymic Extensions of كَهْرَبَاء (kahrabā')

The meaning of كَهْرَبَاء (kahrabā') in (1) in Table 1 is metonymically projected to the meaning of 'power or the public supply of electricity, wiring (in domestic installation)'. This can be explicated with reference to electricity/electric current for electric circuit; in other words, electricity (electric current) stands for Electric Circuit (device that provides a path for electrical current to flow).

In (3) in Table 1, the meaning of كَهْرَبَاء (kahrabā') is metonymically extended to 'source of electric lighting', a device used to produce light. This semantic extension can be comprehended with reference to electricity/electric current for instrument/source of illumination as electricity (electric current) stands for Instrument (the instrument employed to produce light).

The meaning of كَهْرَبَاء (kahrabā') in (4) in Table 1 is metonymically projected to 'seizure'. In such projection, Electricity stands for Unusual Electrical Activity. This is because seizure occurs when electrons or electrical signals in the brain, which enable the brain to reason and transmit instructions to parts of the body, surge. Therefore, Electricity (source domain) is mapped on Unusual Electrical Activity (target domain). In English, in contrast, this brain disorder is denoted by the word *seizure*, an existing word which means 'the act of taking over by force'. The malfunction in the brain

results in loss of body control; in other words, the activity in the brain which controls the whole body through electrical signals is taken over by force, driving the body to function abnormally. The semantic extension here is motivated by conceptual metaphor.

### 3.3 The Polysemy and prototypical meanings of ضَوْء (ḍaw') (light)

The word ضَوْء (ḍaw') linguistically signifies the concept of LIGHT in Standard Arabic. This term has been selected to serve the scientific terminology instead of the word نُور (nūr) (light) whose semantic properties are the same as the semantic features of ضَوْء (ḍaw'). Most dictionaries do not refer to the difference between these two lexical items. However, the term ضَوْء (ḍaw') is considered as stronger than نُور (nūr), because ضَوْء (ḍaw') provides light and heat. The moon, in contrast, shines by reflected light, it acts against the rays of the sun which lights it. This dissimilarity dates to the Koranic elucidation as the Koran describes the sun as ضِيَاء (ḍiyā'), a synonym of ضَوْء (ḍaw'), and the moon as نُور (nūr) (Lane, 1863; Ibrahim Mustafa *et al.*, 2008) [19, 11]. In comparison, the word *light* includes both meanings, it can be used to represent the sun and the moon, as in *sunlight* and *moonlight*.

Equivalent to the word كَهْرَبَاء (kahrabā'), the term ضَوْء (ḍaw') has a polysemous nature. As the data compiled from *ArabiCorpus* show, the word ضَوْء (ḍaw') means 'light or what makes things visible', 'clarity or explanation', 'permission', 'knowledge, awareness', 'hope' and 'brightness, light'. Table 3 illustrates this polysemy.

Table 3: The Meanings and Examples of ضَوْء (ḍaw')

Meanings	Examples
(1) 'light; what makes things visible (natural and artificial)'	... تعود إلى إشعال الضوء وتقضي مع كتبها ساعات طويلة... ...ta'ūdū ilā ish'ālī ḍḍaw' i wa taqḍī ma'a kutubihā sā'ātin ṭawīla... ...she turns the light on again and spends long hours with her books...
(2) 'explanation or clarity (preceded by the verb ألقى ('alqā) (shed) and followed by the preposition عَلَى ('alā) (on))'	أما ماذا دار في المكالمة فقد ألقى الضوء على وجود تداعيات سياسية للقضية. ammā māḍā ḍāra fī lmukālamati faqad alqā ḍḍaw' a 'alā tadā'iyātin siyāsiyatin lilqadiyya. But what circulated in the phone call has shed light on the existence of political repercussions of the case.
(3) 'permission (preceded by the verb أعطى ('a'tā) (give) and followed by the adjective الأخضر (al-'akhḍara) (the green)'	أعطى المكتب التنفيذي الضوء الأخضر للمشاركة في دورة قبرص الدولية... ...a'tā 'l-maktabu ttanfīḍī ḍḍaw' a l'ahḍara lilmušarakati fī dawrati qubrus ddawliya... ...the Executive Office gave the green light to participate in Cyprus International Tournament...
(4) 'knowledge, awareness' (preceded by the verb سَلَطَ and followed by the preposition عَلَى ('alā) (on)). The verb سَلَطَ (sallata) (to empower, extended to 'bring to', as part of the idiomatic expression سَلَطَ الضَّوْءَ عَلَى (bring to light or highlight)	الفيلم استطاع أن يسلط الضوء على الآثار النفسية والاجتماعية والأسرية التي تعاني منها الفتاة... al-film staṭā'a an yusallīṭa ḍḍaw' 'alā l'āṭār nnafsiya wa l-'ijtimā'iya wa l'usariya llatī tu'ānī minhā l-fatāt... The film was able to highlight the psychological, social and familial effects on the girl...
(5) 'hope'	تشكيل اللجنة الحكومية وإن جاء متأخرا يمنح خيطا من الضوء والتفاؤل taškīl allajna alḥukūmiya wa in jā'a muta'ahḥiran yamnaḥu ḥayṭan mina al-ḍḍaw' wa al-ttafā'ul. The formation of the governmental committee, albeit belated, gives a thread of light and optimism.
(6) 'brightness, light'	قبلك... كانت عيناى مطفأتين، لأن ضوء وجهك لم يشرق بعد Qablak... kānat 'aynayī mupḥāṭayn, lān ḍwaw' wajhik lam yuṣriq ba'd. Before you... my eyes were extinguished, because the light of your face had not shined yet.

It is worth mentioning that Arabic ضَوْء (ḍaw') and English *light* overlap in the above-mentioned meanings:

- There were rapid footsteps outside my bedroom door, and then I saw the *light* of a candle in the room.
- Even if you went to the police now, your story doesn't shed any *light* on who did it.
- The project is currently awaiting a green *light* from the government...
- Taking enforcement action requires in the first place techniques to bring deviance to light.
- There were, however, rays of *light* at the end of the disclosure tunnel.
- ... his eyes shone with the brightness and power of a great intellect <sup>[3]</sup>.

Nonetheless, English *light* has a more complex polysemous nature than Arabic ضَوْء (ḍaw'). This is because Arabic has two different terms to signify light: ضَوْء (ḍaw') and نُور (nūr). Many other meanings of *light* that differ from ضَوْء (ḍaw') overlap with the word نُور (nūr). For instance, 'spiritual awareness or divine illumination' can be denoted by نُور (nūr), not ضَوْء (ḍaw'), and *light* in Arabic and English respectively, as shown in the following example:

- (a) مظلمة هي الدنيا بلا نور الايمان...  
muzlimatun hiya ddunyā bilā nūri l'īmān...  
The world is dark without the light of faith <sup>[4]</sup>.

The word ضَوْء (ḍaw') derives from the verb ضَاء (ḍā'a) or the verb أضاء (aḍā'a) (to light) (Scher, 1987-1988) <sup>[22]</sup>. The verb ضَاء (ḍā'a) is a synonym of أضاء (aḍā'a), but it can only be intransitive. In contrast, the verb أضاء (aḍā'a) can be both transitive and intransitive (Ibn Manẓūr, 2003; Al-Fayyūmī, 1368) <sup>[10, 2]</sup>. For instance, we can say ضَاعَتِ النَّارُ / ضَاعَتِ / ضَاعَتِ النَّارُ (ḍā'at/ aḍā'at nnāru) (the fire lit) and أضاءها غيرُها (aḍā'ahā ġayruhā) (it was lit by others).

The citations where the word ضَوْء (ḍaw') is stated were reviewed. It was found out that the most frequent collocates are سَلَّطَ (sallaṭa) (to empower), ألقى (alqā) (to shed), أَخْضَرَ (aḥḍar) (green), شَمْسٌ (šams) (sun) and قَمَرٌ (qamar) (moon). Table 4 details these frequent collocates.

Table 4: The Most Prototypical Collocates of ضَوْء (ḍaw')

Concept	Class (Words in Freq. Order)	Item	Grammatical Category	Number of Frequencies
Light	1 <sup>st</sup> Item	سَلَّطَ (sallaṭa) (to empower, extended to 'direct attention to, or highlight', as part of the idiomatic expression سَلَّطَ الضَّوْءَ عَلَى)	Verb in different morphological forms, e.g., يُسَلِّطُ (yusallīṭu) (present, third person, masculine), سَلَّطَ (sallaṭa) (past tense, third person, masculine), تَسَلِّطُ (taslīṭ) (verbal noun), مُسَلِّطًا (musallīṭan) (gerundive, highlighting) and مُسَلِّطٌ (musallīṭ) (noun)	2374
	2 <sup>nd</sup> Item	ألقى (alqā) (to shed, to throw)	V. with different morphological and grammatical forms, e.g., ألقى (alqā) (past tense, third person, masculine), يلقى (yulqī) (present, third person, masculine), إلقاء (ilqā') (shedding) (verbal noun) and ملقياً (gerundive, shedding)	1489
	3 <sup>rd</sup> Item	أخضر (aḥḍar) (green)	Adjective	1401
	4 <sup>th</sup> Item	شمس (šams) (sun)	Noun (singular)	442
	5 <sup>th</sup> Item	قمر (qamar) (moon)	Noun in different forms: قمر (qamar) (singular) and أقمار (aqmār) (plural)	246

<sup>3</sup> These citations are retrieved from BNC.

<sup>4</sup> This example is taken from ArabiCorpus.

The most frequent collocate of ضَوْء (daw'), then, is سَلَّطَ (sallata) (direct or bring to, in the context of the citations extracted), demonstrating that the most prototypical meaning of ضَوْء is 'knowledge or awareness'.

### 3.4 Metaphorical and Metonymic Extensions of ضَوْء (daw')

The semantic extension of the noun ضَوْء (daw') to 'explanation or clarity' in (2) in Table 3 can be described in terms of LIGHT IS KNOWLEDGE conceptual metaphor. In this extension, LIGHT- that is, what makes things visible, *shedding light on* in the example given, is mapped onto KNOWLEDGE, making something clear. This conceptual metaphor seems to motivate the semantic projection of ضَوْء (daw') to 'knowledge, awareness' in (4) in Table 3 as well. In this semantic expansion, 'what makes things seen' is mapped onto 'what brings to the awareness and adds to the knowledge of a person'.

In (3) in Table 3, the meaning of ضَوْء (daw') is projected to 'permission' in the expression 'to give the green light to'. This extension is motivated by part for whole metonymy as Green Traffic Light stands for traffic light-that is, permission to start moving. This sense extension is also motivated by conceptual metaphor: Psychological forces are physical forces. In such semantic projection, physical force (i.e., physical permission to move) is mapped onto psychological force (i.e., permission to do something, to participate in the example provided).

The sense 'hope' in 4 in Table 3 is the outcome of metaphorical projection. The metaphor light is hope is an image in which the source domain light, that is, a source of illumination, is mapped onto the target domain HOPE, the possible fulfilment of a desire. A thin thread of light can emerge from darkness, and likewise a thin thread of hope can spring in a difficult situation.

## 4. Discussion

The members of the category كَهْرَبَاء (kahrabā'): 'power, the public supply of electricity', 'consumption of electricity', 'source of electric lighting' and 'seizure', are interrelated as they all converge around the central member: 'power or electrical energy'. Except for 'seizure', all the senses seem to share some semantic features with the prototype. That is, electricity is a form of energy transferred to consumers in the form of electric current through a wire or cable for certain uses like powering machines. This proposition is supported by the data retrieved from *ArabiCorpus*, in which the prototype of كَهْرَبَاء (kahrabā') is power, given its most frequent collocate, water, as well as the other four recurrent collocates: وِزَارَة (wizāra) (ministry), شَرِكَة (šarika) (company), مَحَطَّة (maḥaṭṭa) (station) and تَوَلِيد (tawlīd) (generation). In the case of the last member of the category كَهْرَبَاء (kahrabā'), 'seizure', in contrast, there is an electrical imbalance in the brain. The semantic expansion of the category كَهْرَبَاء (kahrabā') is mainly motivated by conceptual metonymy.

The category ضَوْء (daw), in comparison, comprises the subcategories 'light or what makes things visible', 'clarity or explanation', 'permission', 'knowledge, awareness' 'hope' and 'brightness, light'. Deriving from the original meaning "illumination", the expansion of the word ضَوْء (daw) to a more complex 'radial category' can be accounted for with reference to the prototype 'knowledge'. In addition, two main

meanings of the category are motivated by the LIGHT IS KNOWLEDGE conceptual metaphor. Overall, the semantic extension of ضَوْء (daw) is motivated by different mechanisms, namely conceptual metaphor and conceptual metonymy.

The cognitive models of the categories كَهْرَبَاء (kahrabā') and ضَوْء (daw), outlined above, are triggered whenever a native speaker of Arabic conceptualises the terms كَهْرَبَاء (kahrabā') and ضَوْء (daw) respectively. This causes students to face serious challenges in understanding these terms within a scientific context. In everyday speech, electricity regularly denotes power. In scientific language, however, electricity, as defined in *A Dictionary of Physics* [12], is the result of the existence of stationary or moving electric charges. This natural phenomenon is distinct from power, the main association with electricity in everyday language. The word *power* itself has a different meaning in physics, namely the rate of energy transfer (*A Dictionary of Physics*) [12]. When electricity is used in a scientific domain, several cognitive models are invoked, including electrons, protons, current and resistance.

In the same vein, light, which relates to illumination and knowledge in everyday speech, is completely different from the scientific concept of light. Within the scientific domain, light is a form of electromagnetic radiation that gives a nervous sensation (i.e., vision) once it encounters the eye. In vision, the wavelength of light is associated with colour as it ranges from 750 nm (red) to 400 nm (blue) (*Internet-linked Dictionary of Physics*) [6]. What makes the scientific concept of light even more challenging and abstract is its dual nature. Sometimes, light behaves like a wave, at other times it behaves like a particle (*A Dictionary of Physics, Internet-linked Dictionary of Physics*) [12, 6]. Light as a physics concept evokes knowledge of other cognitive models, viz. colour, reflection, refraction and energy.

Employing prior knowledge of كَهْرَبَاء (kahrabā') and ضَوْء (daw) in a physics class can certainly lead to confusion and so obstruct learning these concepts, taking into consideration the wide gap between their use in everyday language and in scientific terminology.

## 5. Conclusion

Non-scientific knowledge about physics is commonplace among students as they form notions of physics by interacting with physical objects around them. In general, people interchange with the physical world. They raise objects of different weight, they throw and hold them and so on and so forth (diSessa, 1986) [7]. However, the differences between non-scientific and scientific senses result in students' inconsistent ways of understanding scientific concepts (i.e., electricity and light in this paper). These diverse modes of cognisance characterise folk and expert models in such fields as physics, comprising idealised cognitive models with equivalent terminology (Lakoff, 1987) [17]. As Lakoff (1987) asserts, it is customary for these idealised cognitive models to have nothing in common with each other. Nonetheless, the main difficulty lies in applying a cognitive model in its relevant context. In this connection, learners may understand the scientific concepts electricity and light in accordance with their cultural, social and bodily knowledge and experience instead of the intended scientific world view. As this model is

averse to change (Chi, 2005; Kuhn, 1989) <sup>[5, 14]</sup>. students, first and foremost, ought to be conscious of the differences between their knowledge and scientific world view (Vosniadou and Brewer, 1992; Carey, 1986) <sup>[24, 4]</sup>.

## 6. References

1. Aikenhead G, Ogawa M. Indigenous Knowledge and Science Revisited. *Cultural Studies of Science Education*. 2007; 2(3):539-620.
2. Al-Fayyūmī, Aḥmad ibn Moḥammad. *Āl-Miṣbāḥ Ālmunīr fī Garīb al-Šsarḥ al-Kabīr*. Dār al-Ma'ārif, Cairo, 1368.
3. Bowker L, Pearson J. *Working with Specialized Language: A Practical Guide to Using Corpora*. Routledge, London, 2002.
4. Carey S. Cognitive science and science education. *American Psychologist*. 1986; 41:1123-1130.
5. Chi MTH. Commonsense conceptions of emergent processes: Why some misconceptions are robust. *The Journal of the Learning Sciences*. 2005; 14(2):161-199.
6. Deeson E. *Internet-linked Dictionary of Physics*. Harper-Collins, London, 2007.
7. diSessa AA. What do 'just plain folk' know about physics? In D. R. Olson & N. Torrance (Eds.), *The handbook of education and human development: New models of learning, teaching and schooling*. Blackwell, Cambridge, MA, 1996, 709-730.
8. Geeraerts D. Where Does Prototypicality Come from? In D. Geeraerts, R. Dirven, J. R. Taylor, & R. W. Langacker (Eds.), *Words and Other Wonders: Papers on Lexical and Semantic Topics*. Mouton de Gruyter, Berlin, 2006, 27-47.
9. Ho-Abdullah I, Hashim RSA. Cognitive Semantics Analysis of Alam (Nature) in Malay. *European Journal of Social Sciences*. 2009; 8(1):140-151.
10. Ibn Manzūr, Muḥammad ibn Mukarram. *Isānu l-'arab. dār ṣādr* Beirut. (Original work published 1881 and 1882). 2003,
11. Ibrāhīm Mustafā, Aḥmad Ḥassan al-Zayyāt, Ḥāmed 'Abdel-Qāder and Moḥammad 'Alī al-Najjār. *Al-Mu'jam al-Wasīf*. Dar al-Iḥyā al-Turāth al-'Arabi, Beirut, 2008.
12. Isaacs A. (editor). *A Dictionary of Physics*, 4th edition. Oxford University Press, Oxford, 2000.
13. Kawasaki K. The Concepts of Science in Japanese and Western Education. *Science and Education*. 1996; 5(1):1-20.
14. Kuhn D. Children and adults as intuitive scientists. *Psychological Review*. 1989; 96(4):674-689.
15. Lahlou H. Hajar Abdul Rahim. A Cognitive Linguistic Analysis of the Concept TEMPERATURE in English and Arabic. *Arab World English Journal*. Special Issue on Translation. 2013; 2:118-128.
16. Lahlou H, Rahim HA. Culture and Conceptualisation of Scientific Terms: An Analysis of the Concepts "Weight" and "Mass" in Arabic and French. *KEMANUSIAAN The Asian Journal of Humanities*. 2016; 23(2):19-37.
17. Lakoff G. *Women, Fire, and Dangerous Things: What Categories Reveal about the Mind*. Chicago, The University of Chicago Press, 1987.
18. Lakoff G, Johnson M. *Metaphors we Live by*. The University of Chicago Press, Chicago, (Original work published, 2003-1980)
19. Lane EW. *Arabic-English Lexicon*. Willams & Norgate, London, 1863.
20. Rosch E. Natural Categories. *Cognitive psychology*, 1973; 4(3):328-350.
21. Rosch E. Cognitive Representations of Semantic Categories. *Journal of Experimental Psychology: General*. 1975; 104(3):192-233.
22. Scher, Addai. *Kitāb al-Alfāḍ al-Fārisiyya al-Mu'arraba*. Dār al-'Arab, Cairo, 1987-1988.
23. Soanes C, Hawker S. (editors.). *Compact Oxford English Dictionary of Current English*, 3rd edition. Oxford University Press, Oxford, 2008.
24. Vosniadou S, Brewer WF. Mental models of the earth: A study of conceptual change in childhood. *Cognitive Psychology*, 1992; 24:535-585.