Exploring Strategies of Translating Metaphor from English into Arabic with Reference to Scientific Texts

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ABSTRACT

Metaphors play an important role in conveying meaning not only in literary texts but also in scientific genres. Although there have been many translation studies on metaphor in literary texts, studies on metaphor translation in scientific settings seem to have been overlooked and received less attention. Therefore, this study aimed to identify the strategies used in translating scientific metaphors from English to Arabic by Yemeni senior translation students in three universities. This was achieved by using a translation test consisting of (33) metaphors selected from various sources based on Lakoff and Johnsen's (1980; 2003) classification of metaphor. The test was given to a sample of 91 students who were randomly selected. 72 participants completed the test. Data were analyzed quantitatively and qualitatively. Results showed that eight strategies, adapted from Alshunnag (2016), were used. The highly frequent strategy was the *literal* strategy and the least frequent was the *explication* strategy. The use of literal strategy indicated the difficulty of finding a metaphorical expression of a different type for the English metaphors in Arabic which might be due to the limited time available for translation and lack of knowledge of the metaphorical structure in both the source and target languages. It was recommended, therefore, that more comparative studies should be done to help improve translation training offered to students who should also be provided with training sessions which are more conducive to learning.

INTRODUCTION

Translating metaphors from one language to another is a challenging task for translators due to certain reasons including linguistic and cultural dissimilarities between the source and the target language. These challenges lie in the fact that metaphors contain both speakers' meaning and word or sentence meaning (Bell, 1991; Ortony, 1993; Mohammed, 2011) and cultural meaning (Aldanani, 2018; Luo, Dong, & Zhang, 2019). The same metaphoric image might not necessarily evoke the same meaning in another language (Jalali, 2016). Since the process of translating metaphors is blended with linguistic and cultural variations between the two languages, translators have to be careful of using appropriate strategies to convey the intended meaning. Traditionally, metaphor has been viewed as a rhetorical device of literary texts and irrelevant in scientific genre (Lakoff & Johnsen, 1980 & 2003; Alshunnag, 2016). This view allowed researchers to contribute to translation studies by investigating metaphor in literary texts. Previous studies confirm that metaphor translation seems to be overlooked in scientific texts compared to studies on metaphor translation in literary texts (Al-Harrasi, 2001; Boase-Beier, 2006; Massey, 2017; Merakchi, 2018). According to Bleakley (2017), metaphors are not only used in literary texts but also in scientific texts. Translating metaphors in scientific texts becomes more difficult because the text involves new and innovative scientific and technology terms. As Mishankina and Panasenko (2016) pointed, the field of technology is full of metaphors. According to Byrne (2006) metaphor translation in scientific texts is different from other types of translation in that its purpose is not to reproduce the source text in another language; instead, it presents the scientific content to new audience, (Byrne, 2006; Taylor & Dewsbury, 2018). Therefore, skillful scientific translators are supposed to be familiar with cultural, social and linguistic features of both the source and target texts. In the case of translating metaphors from English to Arabic, the two languages do not belong to the same family which causes many linguistic and cultural variations that translators may encounter in the process of translating metaphorical expressions in scientific texts. Furthermore, the classification of metaphors in English differs from Arabic in that a metaphor in English may not be considered a metaphor in Arabic which may constitute another challenge. Keeping this in mind, the present study aims to explore the strategies of translating scientific metaphors from English to Arabic used by senior translation students in three Yemeni universities: Sana'a, Science and Technology, and Modern Sciences.

LITERATURE REVIEW

Newmark (1981) defines translation as a "craft consisting of the attempt to replace a written message and/or statement in one language by the same message and/or statement in another language" (p. 7). This narrow definition of translation as a meaning transfer was perceived as a problematic issue when it is linked to metaphor translation (Shuttleworth, 2017). The challenging problem of metaphor translation lies in the fact that metaphor contains a mixture of both speakers' meaning and word or sentence meaning (Bell, 1991; Ortony, 1993). It is used to express cultural meaning (Aldanani, 2018) and reflects how people think and look at life and communication (Thibodeau, Matlock, & Flusberg, 2019).

Owing to the challenges of metaphor translation, metaphor researchers have been interested in exploring cross-cultural similarities and variations in metaphor translation but their contributions have focused mostly on literary texts (Al-Harrasi, 2001; Massey, 2017). According to Massey (2017) and Merakchi (2018), metaphor translation in scientific texts appears to be overlooked compared to metaphor translation in literary texts. This is probably due to the older perspective that scientific language and metaphors are completely incompatible and thus metaphor had no space in scientific language (Finatto, 2010). Surprisingly, a number of previous studies have mainly focused on literary texts (e.g. Alvarez, 1993; Dagut, 1976; Fung, 1995; Kruger,1993; Jay-Rayon, 2007; Mason, 1982; Maalej, 2008; Omar, 2012; Nurfadilah, Firdaus & Nargis, 2019). In contrast with the traditional view of literary metaphor, Lakoff and Johnsen (1980) established a new cognitive view of metaphor demonstrating that metaphor is not only used in poetic language but also in people's thoughts and actions. They have developed a new conception that is called the cognitive linguistic theory of metaphor. Furthermore, Lakoff and Johnsen (2003) classified metaphors into three types: structural, ontological, and orientational. The present study revolves around this taxonomy which will be thoroughly investigated throughout the study. Based on this view, studies on the translation of metaphors in scientific texts between different pairs of languages have been conducted. In a very recent study on the strategies of metaphor translation, Nurfadilah, Firdaus & Nargis (2019) have emphasized that the strategy of translating metaphors constitutes a thinking process on the part of translators, which should be considered carefully.

With regard to strategies used for translating metaphors, a number of scholars proposed different sets of strategies including Newmark (1988); Bojović (2014); Toury (1995) and Schäffner (2004). Based on an extensive review and critique of these sets of procedures and strategies of translating metaphors generously spelled out in the literature of translation studies, particularly those of Toury (1995) and Schäffner (2004). Alshunnag (2016) has meticulously developed a framework of strategies which he used for analyzing his data. Therefore, the current study will make use of the same framework, with a slight modification, to analyze the data collected from the participants' translations.

Four empirical studies were conducted on the translation of metaphors in scientific texts but they used different text types. Three studies including Alshunnag (2016), Nader (2013) and Al Jumah (2007) were conducted between English and Arabic. The fourth one, Abdullah and Shuttleworth (2013), was conducted between English and Malay. They all classified metaphors according to Lackoff and Johnsen's (1980; 2003) taxonomy, except Abdullah and Shuttleworth who used Newmark's (1988) classification.

Alshunnag (2016) and Nader (2013) aimed to examine the techniques according to which metaphors are rendered into Arabic. Alshunnag (2016) chose 59 English articles from the *Scientific American* magazine and their Arabic translations available in *Majallat Al-Aloom*. 684 metaphors were rendered into parallel TL metaphors using elaboration, explication, and shifting to different TT metaphorical expressions. 30 SL metaphors were rendered into different TL metaphors and sixteen SL metaphors into non-metaphorical expressions. On the other hand, Nader (2013) chose fifty articles collected from *Financial Times* and their Arabic translations in *Al-Iqtissadia* newspaper. He found forty-three metaphorical expressions in English. Only four of them were omitted in Arabic. This emphasizes the translatability of metaphors between English and Arabic. The last three metaphors were rendered into another source domain in Arabic. There were four English non-metaphorical expressions that were rendered into Arabic metaphors.

Likewise, Abdullah and Shuttleworth (2013) used an engineering book and its translation in Malay. They found 300 metaphors and chose the first 30 metaphors to be the research data. It is similar to the above two studies in that it investigated the type of metaphors in the two languages which differ according to the strategy used in rendering them. They found that stock metaphor is the most frequent type used in both ST and TT compared to the other 5 types of metaphors. 20 English metaphors were omitted in the TT. Seven out of 30 metaphors were rendered into the same type of metaphor and 3 into a different type. There was only one English non-metaphorical expression that was rendered into a metaphor in Malay.

As it has been seen above, there is a gap in the body of knowledge of translating metaphors especially between English and Arabic in the science genre. The scarcity of work on the translation of scientific metaphor may indicate the novelty of the topic and the necessity for conducting this study.

METHOD

Population and Sample

Ninety-one senior translation students from three universities (see Table 1) participated in this study. They were selected in a systematic random method and based on their academic records; only students of advanced level were included for the study.

Research Tools and Materials

In order to identify the strategies that translation students at Yemeni universities use in translating English scientific metaphors from English into Arabic, two instruments were used to collect the data: a translation test and a checklist. The test was

composed of twenty-three sentences in which 33 metaphors were used (See Appendix 1). The English scientific metaphors were collected from different scientific texts based on Lakoff and Johnsens' (1980) classification. The sentences of the test were translated by a professional translator and were then given to other five professional translators and academicians for validation (See Appendix 2). The second instrument was a checklist of metaphor translation strategies adapted from Alshunnag's (2016: 62) study. These strategies are presented below.

1. Literal: the ST metaphorical expression is rendered literally.
2. Explication: the ST metaphorical expression is explicated in the TT.
3. Elaboration: the ST metaphorical expression is more elaborated in the TT.
4. Explication & Elaboration: the ST metaphorical expression is explicated and elaborated in the TT.
5. Different TT metaphorical expression: the ST metaphorical expression is translated with a different TT metaphorical expression.
6. Different conceptual and metaphorical expression: the ST conceptual metaphor is rendered differently in the TT, with different conceptual and metaphorical expression.
7. Non-metaphorical: The ST metaphorical expression is rendered into a non-metaphorical expression in TT, without any metaphorical image.
8. Deletion: The ST metaphorical expression is not rendered at all in the TT, and thus the conceptual metaphor is deleted.

Data Analysis

It is worth indicating that 91 test papers were distributed but only 72 were valid for analysis and discussion. The remaining 19 test papers were discarded as they were incomplete. The

Table 1. Distribution of the participants across three universities

University	Participants
Sana'a University	48
University of Science and Technology	26
University of Modern Sciences	17
Total	91

strategies that translation students used in translating English scientific metaphors were categorized based on Alshunnag's (2016) set of procedures. Strategies used by the study participants are presented along with the metaphors. Frequency and percentages of each strategy are also matched to metaphors.

RESULTS

Table 2 presents a summary of the total uses of strategies used by the study participants to translate 33 metaphors into Arabic as well as the percentages and rank of each strategy. On the other hand, Table 3 displays detailed frequencies of the strategies used for each metaphor. Below, discussion of each strategy is presented separately based on their ranking.

Literal Strategy

This strategy was frequently used by the participants to render the metaphors shown in Table 4. It can be noticed that these metaphors are sometimes used to describe human beings as computer machines who can perform certain functions. Some other times, computer machines are given the features of humans. It seems, therefore, that the participants were aware of these shades of meaning and resorted to the literal strategy in order to deliver the intended meaning.

Non-metaphorical

This strategy came in the second rank in terms of use by the participants. Table 5 presents the metaphors which were translated into Arabic by the use of *non-metaphorical* equivalence.

It can be observed from Table 5 that the participants were able to assimilate the basic meaning of the metaphor, but could not get a similar metaphor in Arabic which has similar effect on the reader. Some of the translations are not accurate such as metaphors 1 and 2 as they are literal translations of the source metaphor. However, other metaphors such as 17, 18 and 31, though they were not translated into metaphors, the non-metaphorical expressions used were clear and acceptable.

Different TT Metaphorical Expression

As indicated in Table 2, this strategy came in the third rank in terms of use by the participants. Table 6 below shows the translations as a result of using this strategy.

Table 2. Order of strategy use

No.	Strategy	Total uses	%	Rank
1	Literal	760	32	1st
2	Non-metaphorical	669	28	2nd
3	Different TT metaphorical expression	267	11	3rd
4	Different conceptual and metaphorical expression	236	10	4th
5	Deletion	215	9	5th
6	Elaboration	112	5	6th
7	Explication & elaboration	76	3	7th
8	Explication	41	2	8th

Table 3. Uses of each strategy in translating each metaphor

Strategy / Metaphor No.	Literal	Explication	Elaboration	Explication & elaboration	Different TT metaphorical expression	Different conceptual and metaphorical expression	Non-metaphorical	Deletion
1						55	12	5
2						62	10	
3							51	21
4	57		12					3
5						40	30	2
6						37	24	11
7							72	
8					13		28	31
9	23	3	9	15			2	20
10	29			3	34			6
11	27		2		11		28	4
12	23	2	25	10	9		3	
13	37		8		13		3	11
14	62				5			5
15	28	1	12	20			1	10
16	49		3	9	2		4	5
17			3	9		35	21	4
18							72	
19	28			1	42		1	
20					45		27	
21					29		37	6
22					9		62	1
23	34						26	12
24					11		31	30
25	71							1
26	65							7
27	68							4
28	64							8
29	23	10					36	3
30	41			9	22			
31	43	14			2		13	
32		10	37		8		16	1
33					1	6	60	5
Total uses of each strategy	760	41	112	76	267	236	669	215
	32%	2%	5%	3%	11%	10%	28%	9%

Looking at the table above, it is obvious that some of the participants' translations are not acceptable in terms of meaning. For example, metaphors 32 may not be clear considering the context in which they are used. Other translations, on the other hand, seem to deliver the intended meaning effectively such as metaphors 11 and 20 which seem to express the meaning accurately.

Different Conceptual and Metaphorical Expression

By a close look at Table 7, this strategy was applied by the participants to 6 metaphors only with high percentages except the last metaphor "reboot" which was translated by only 8.3% of the total sample. It can also be emphasized that almost all the renderings into Arabic are acceptable and easy to understand. This suggests that the participants who

Table 4. Literal strategy

Metaphor No.	Metaphor	Participants' Translation	%
4	Your minds have **programmed** you	برمجتكم عقولكم	79
9	Why think if the computer can do **thinking** for you?	التفكير	32
10	The computer's **telling** them it's in stock	يخبرهم	40.2
11	I've **tired** my computer out	أتعبت	37.5
12	is said to have **intelligence**.	ذكاء	32
13	how did the computer **feel** when it is lost?	يشعر	51.3
14	the computer **refused** to issue her checks	رفض	86
15	I loved my computer for its **friendly criticism**	نقده الودي	38.8
16	...and the good **advice** it gave me	النصائح	68
19	The body **defends** against cancer	يدافع	38.8
23	with a high index of **suspicion** in order to	الاشتباه	47.2
25	Enter the user name and **password**	كلمة المرور	98.6
26	to open your router's configuration **webpage**.	صفحة	90
27	The computer case, wiring, **tools**	الأدوات	94
28	and **machinery**	الآلات	89
29	are examples of **hardware**.	(المعدات) (الأجهزة)	31.9
30	Antibodies are **defending against**	تدافع	57
31	this **onslaught**.	الهجوم	59.7

Table 5. Non-metaphorical strategy

Metaphor No.	Metaphor	Participants' Translation	%
1	The patient **sank** into a coma.	غرق	16.6
2	to get the **upper hand** against a virus...	اليد العليا	13.8
3	the disease's **trademark** fever	أعراض	71
5	The patient is **full of** cancer.	انتشر السرطان	41.6
6	We must **get to the bottom** of the problem.	أسباب المشكلة	33.3
7	After **awaking** his computer	تشغيل	100
8	...from its power-save **slumber** he copied...	السبات	39
9	Why think if the computer can do **thinking** for you?	يشتغل	2.7
11	I've **tired** my computer out	توقف	38.8
13	how did the computer **feel** when it is lost?	كيف يعمل	4.1
15	I loved my computer for its **friendly criticism**	لنظامه	1.3
17	...to **outwit** the immune system.	تنشيط	29.1
18	It's an **overwhelming** infection.	منتشرة	100
19	The body **defends** against cancer.	يمتلك الجسم مناعة	1.3
20	We have **wiped out** smallpox.	عالجنا	37.5
21	This **sinister** disease requires a rigorous history	العضال	51.3
22	to be taken plus a **searching examination**	فحص	86.1
23	together with a high index of **suspicion** in order to	الشك	36.1
24	spot **the tell tale clues** and make the correct diagnosis.	رواية الأدلة	43
29	are examples of **hardware**.	الأجزاء الصلبة للحاسوب	50
31	....this **onslaught**.	فيروسات	18
32	...may be able to **infiltrate** a wider range of diseases at lower cost.	تسريب/ ترشيح	22.2
33	cloned stem cells might "**reboot**" the immune systems...	يعيد تشغيل	83.3

resorted to this strategy fully captured the intended meaning and managed to express it effectively.

Deletion

Compared to strategy 4 which was used by 10% of the participants, this strategy, which ranked fifth, was used by a slightly smaller percentage of the participants (9%). However, the latter strategy was used to translate most of the metaphors whereas the former one was used to translate 6 metaphors only. This may indicate two things. First, the deletion strategy was adopted by the participants as they probably were not able to find out the equivalent metaphors in Arabic. However, they were able to keep the basic meaning of the sentence as a whole. Second, the participants who used strategy 4 might have some background knowledge about using Arabic in a medical context. In this section the deletion strategy, which came in the fifth rank in terms of use, is presented in Table 8.

Table 8 above shows that (9%) of the participants avoided translating English metaphors into metaphors in Arabic. Alternatively, they resorted to translating the whole sentence without using a metaphor. They sometimes made no reference to the metaphors at all, as in 11, 15, 27 and 28.

Elaboration

By using this strategy, only (5%) of the participants were able to translate the metaphor into Arabic with more elaboration by changing a verbal lexical form into an adjectival form, a nominal lexical form into a verbal form, or vice versa. They applied this strategy to 8 metaphors as shown in table 9 below.

It can be clearly noticed that using the elaboration strategy is sometimes helpful in rendering the meaning of a source language metaphor into a target one. See metaphors 4 and 17, for example.

Explication and Elaboration

Under this strategy, in addition to changing a verbal form into a noun form or adjectival form, (3%) of the participants tried to add the particle (*?n* أن) before the verbal lexical form or add a preposition (ـب *bi* or *li* ـل) before the noun or after the verbal lexical form. In all cases the meaning of the metaphor was clear.

Looking at the table above, it can be said that the participants who employed the strategy of explication and elaboration succeeded in delivering the intended meaning into the target language.

Table 6. Different TT metaphorical expression

Metaphor No.	Metaphor	Participants' Translation	%
8	from its power-save **slumber** he copied	السكون	18
10	The computer's **telling** them it's in stock.	يعلمهم	47.2
11	I've **tired** my computer out	أجهدت	15.2
12	is said to have **intelligence**	عقل/ إدراك	12.5
13	how did the computer **feel** when it is lost?	حال/حالة	18
14	the computer **refused** to issue her checks.	لم يوافق	7
16	and the good **advice** it gave me.	تعليمات	2.7
19	The body **defends** against cancer.	يكافح	58.3
20	We have **wiped out** smallpox.	قضينا على	62.5
21	This **sinister** disease requires a rigorous history	الخبيث	40.2
22	to be taken plus a **searching examination**	فحوصات استقصائية	12.5
24	spot **the tell tale clues** and make the correct diagnosis.	الدلالات المرية	15.2
30	Antibodies are **defending against**...	تقاوم	30.5
31	this **onslaught**.	الاختراق	2.7
32	may be able to **infiltrate** a wider range of diseases at lower cost.	التوغل	11.1
33	cloned stem cells might "**reboot**" the immune systems...	كفاءة يعيد	1.3

Table 7. Different conceptual and metaphorical expression

Metaphor No.	Metaphor	Participants' Translation	%
1	The patient **sank** into a coma.	دخل	76.3
2	to get the **upper hand** against a virus...	يتغلب على	86.1
5	The patient is **full of** cancer.	مصاب	55.5
6	We must **get to the bottom** of the problem.	جذور المشكلة	51.3
17	...to **outwit** the immune system.	اختراق	48.6
33	..cloned stem cells might "**reboot**" the immune systems...	يعيد انعاش	8.3

Table 8. Deletion

Metaphor No.	Metaphor	Participants' Translation	%
1	The patient **sank** into a coma.	اغمي على المريض	6.9
3	the disease's **trademark** fever ...	في أسوأ حالات المرض يتبع الحمى	29
4	Your minds have **programmed** you	...عقلكم حافظ على الثروة والمتعة	4
5	The patient is **full of** cancer.	المريض به سرطان	2.7
6	We must **get to the bottom** of the problem.	يجب أن نعرف المشكلة	15.2
8	... from its power-save **slumber** he copied ...	بعد أن قام بتشغيل حاسوبه من الوضع الموفر للطاقة	43
9	Why think if the computer can do **thinking** for you?	فعل ذلك	27
10	The computer's **telling** them it's in stock	...اتضح لهم أن الكمبيوتر	8.3
11	I've **tired** my computer out	No Indication	5.5
13	how did the computer **feel** when it is lost?	كيف يكون عندما يفقد الكمبيوتر؟	15.2
14	...the computer **refused** to issue her checks.	لم يصدر الكمبيوتر	7
15	I loved my computer for its **friendly criticism**	No Indication	13.8
16	... and the good **advice** it gave me.	ولما يقدمه لي	6.9
17	...to **outwit** the immune system.	تحافظ على قدرتها في النظام المناعي	5.5
21	This **sinister** disease requires a rigorous history	...يتطلب هذا المرض	8.3
22	to be taken plus a **searching examination**	يتطلب الأمر أخذ تاريخ دقيق للمرض الخبيث مع مستوى عال	1.3
23	together with a high index of **suspicion** in order to	بالإضافة الى فحوصات استقصائية لتتبع الدلالات المريبة عن المرض.	16.6
24	spot the **tell tale clues** and make the correct diagnosis.	مع مستوى عال من الاشتباه من اجل تشخيص المرض تشخيصا صحيحا	41.6
25	Enter the user name and **password** to open ...	ادخل اسم المستخدم لفتح	1.3
26	... your router's configuration **webpage**.	لفتح الموجه الخاص بك	10
27	The computer case, wiring, **tools**...	No Indication	5.5
28	...and **machinery**	No Indication	11
29	are examples of **hardware**.	ومن الأمثلة الأدوات والآلات	4.1
32	... may be able to **infiltrate** a wider range of diseases at lower cost.	قادرة على الأمراض	1.3
33	... cloned stem cells might "**reboot**" the immune systems	إن خض الخلايا المكونة لدم المشتقة من الخلايا إن نسختها المستنسخة قد يعيد الأجهزة المناعية (للمصابين بأمراض المناعة الذاتية).	7

Table 9. Elaboration

Metaphor No.	Metaphor	Participants' Translation	%
4	Your minds have **programmed** you against wealth	مبرمجة	17
9	Why think if the computer can do **thinking** for you?	يفكر	12.5
11	I've **tired** my computer out	متعب	2.7
12	...is said to have **intelligence**.	ذكي	34.7
13	...how did the computer **feel** when...	شعور	11.1
15	...for its **friendly criticism**...	ينتقدني	16.6
16	...the good **advice** it gave me.	ينصحني	4.1
17	...their capacity to **outwit** the immune system.	خداع	4.1
32	...may be able to **infiltrate** a wider range of diseases	اختراق	51.3

Explication

This strategy came in the last rank in terms of use by the study participants who added one word before or after the metaphor. It was limited to 6 metaphors only as shown in Table 11 below.

As can be seen in the table above, adding a word before or after the metaphor by the strategy of explication can help in rendering the meaning carried by the source text metaphor. It is a case where the translator shows an ability to clarify the TT metaphor in the ST (Alshunnag, 2016).

Table 10. Explication and elaboration

Metaphor No.	Metaphor	Participants' Translation	%
9	Why think if the computer can do **thinking** for you?	أن يفكر	20.8
10	The computer's **telling** them it's in stock.	يقوم بـ	4.1
12	... is said to have **intelligence**	بذكاء	13.8
15	... for its **friendly criticism**...	لنقده الودي	27.7
16	... the good **advice** it gave me	لنصائحه	12.5
17	... their capacity to **outwit** the immune system	لخداع	12.5
19	... The body **defends** against cancer	يقوم بـ	1.3
30	Antibodies are **defending against**	تقوم بالدفاع	12.5

Table 11. Explication

Metaphor No.	Metaphor	Participants' Translation	%
9	Why think if the computer can do **thinking** for you?	عملية التفكير	4
12	… is said to have **intelligence**.	ذكاء خارق	2.7
15	I loved my computer for its **friendly criticism**	لطريقة انتقاده	1.3
29	are examples of **hardware**	معدات الكمبيوتر	13.8
31	… this **onslaught**.	الهجوم الضاري	19.4
32	… may be able to **infiltrate** a wider range of ..	أن يخترق	13.8

CONCLUSION

The focus of the previous analysis and discussion has been on the translatability and strategies of metaphors in scientific texts from English to Arabic as used by level-four undergraduate students enrolled at three main translation programs offered by three well-reputed universities in Yemen. The participants used different strategies in rendering different metaphors with reference to scientific texts. The participants tended to use the first strategy which is rendering the metaphorical expression into a parallel metaphorical expression with its literal forms, explication, elaboration and rendering the metaphor into the same conceptual metaphor but with different metaphorical expressions. The majority of the participants used the literal strategy which is the rendition of the metaphor into a parallel equivalent. The participants' literal translation indicated the difficulty of finding a metaphorical expression of a different type for the English metaphors. That might be due to the limited time available for translation and lack of background knowledge of the target language. The strategy which came in the second rank was the rendering of the metaphor into a non-metaphorical expression. The participants' rare use of an Arabic metaphorical equivalent of a different type could be due to the translation purpose which was for a research purpose only or because of the nature of the metaphorical image that can affect the strategy used. The least frequent strategy was explication which was employed to a limited number of metaphors. The deletion strategy came in the fifth rank to which participants resorted when they could not understand the source text metaphor or could not find an equivalent. It represented 9% of the total uses of the strategies.

The use of strategy 2 (non-metaphorical expression) and strategy 5 (deletion) indicated the level of the challenge that the participants encountered in translating English metaphors and finding the Arabic metaphorical equivalent. That might be due to the lack of specialized dictionaries or the students' unfamiliarity with the use of metaphors in scientific texts. The latter challenge might be because of the students' unfamiliarity with the English culture and the lack of experience in translating scientific texts. This can also be attributed to the lack of exposure to Arabic metaphors on the part of the participants.

These results are in line with the results of previous studies including Nader (2013), Shraideh and Mahadin (2015), Alshunnag (2016) who investigated the strategies used for translating metaphors and collocations. This emphasizes that metaphors can become untranslatable between English and Arabic due to the lexico-grammatical and cultural differences between the two Languages (Mohammed, 2011). However, such a challenge can be overcome if the translation is based on meaning, not structure. It can be achieved even if the type of metaphor shifts or changes while translating from English into Arabic; or the metaphor disappears (deleted as seen above) and becomes an ordinary expression in Arabic. This is why some participants tended to avoid translating the metaphor either by deleting it or replacing it by a non-metaphorical expression. Though the participants did not provide similar metaphors in their translations, this does not mean that their translations are wrong; rather, they can be considered a different way of expressing the same metaphor in Arabic (Deignan et al. 1997). This is clear in the translations themselves which can be easily understood. It can also be observed that metaphors of similar concept and structure in both English and Arabic are much easier to translate into Arabic than those which are different, (Alshunnag, 2016). Apart from their complex structure and discrepancies, par-

ticularly when comparing two linguistically and culturally different languages, using metaphors in science remains indispensable (Taylor & Dewsbury, 2018). It is, therefore, recommended that the structure and meanings of metaphors in both English and Arabic, particularly in non-literary texts, should be thoroughly studied and analyzed in translation classes at the departments of translation.

DIRECTIONS FOR FURTHER RESEARCH

It is suggested that studies on metaphors should be conducted by involving specialists in pure and applied sciences which might yield meaningful results and findings and could support student-translators' understanding of the use of metaphors in scientific settings. Additionally, a comparative study might be done to compare young-adult student-translators (undergraduate) to adult translators (post-graduate) so as to see the extent of comprehension by both groups of translation trainees (Stamenković, Ichienb & Holyoakb, 2019). Based on the study conducted by Golfam, Ghrbanpour and Mahdipour (2019), it can also be suggested that a comparative study of the conceptual metaphors of time in English and Arabic can be also done.

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APPENDIX

Appendix 1. Scientific metaphor expressions based on lakoff and johnsons' (1980; 2003) classification

No.	Type of metaphor	Type of text
	Orientational Metaphor (Directions)	
1	The patient **sank** into a coma.	Medical OD
2	At long last the immune system might, in some cases, be able to get the **upper hand** against a virus that was killing millions of people around the globe.	Biomedical WD
	Ontological Metaphor (non-physical things as entities, substances or containers or non-human as a human)	
3	In the worst-case scenario, the disease's **trade mark** fever and chills are followed by dizzying anemia, seizures and coma, heart and lung failure-and death.	Biomedical WD
4	Your minds have **programmed** you against wealth and pleasure, against things that make your eyes sparkle and your feet dance.	IT OD
	Container metaphors (human, events, actions, activities, and states as containers)	
5	The patient is **full of** cancer.	Medical OD
6	We must **get to the bottom** of the problem.	Medical OD
	Personification (non-human as a human)	
7	After awaking the computer from its power-save **slumber** he copied the add-in from the disk back to the internal hard drive.	IT WD
8	Why think if the computer can do the **thinking** for you?	IT WD
9	The computer's **telling** them it's in stock.	IT OD
10	"I've sent out so many resumes I've **tried** my computer out," she said.	IT OD
11	And now a computer, a machine, is said to have **intelligence**. Well, if this is the case, how did the computer feel when it is lost?	IT WD
12	Because Medicare still listed her as dead, the computer **refused** to issue her checks.	IT WD
13	I loved my computer for its **friendly** **criticism** and the good advice it gave me.	IT OD
14	Despite these improvements in vaccines, many microorganisms maintain their capacity to **outwit** the immune system.	Biomedical WD
	Structural metaphor (abstract concept "target domain" is understood by means of the structure of concrete concept "source domain")	
15	It's an **overwhelming** infection. (Medicine is war).	Medical WD
16	The body **defends** against cancer.	Medical WD
17	We've **wiped out** smallpox.	Medical WD
18	This **sinister** disease requires a rigorous history to be taken plus a **searching examination** together with a high index of **suspicion** in order to spot **the tell tale clues** and make the correct diagnosis.	Medical WD
19	Enter the user name and **password** to open your router's configuration **webpage**.	IT WD
20	The computer case, wiring, **tools** and **machinery** are examples of **hardware.**	IT WD
21	Tinier "nanobodies," derived from camels and llamas, may be able to **infiltrate** a wider range of diseases at lower cost.	Biomedical

(*Contd...*)

Appendix 1. (*Continued*)

No.	Type of metaphor	Type of text
22	Antibodies are **defending against** this **onslaught**.	Biomedical WD
23	Infusions of blood-forming or hematopoietic, cloned stem cells might **"reboot"** the immune systems of people with autoimmune diseases.	Biomedical WD

Appendix 2. The validated translation of the test sentences

No.	Translated sentences
1	The patient **sank** into a coma. **دخل** المريض في غيبوبة.
2	The immune system might be able to get the **upper hand** against a virus that was killing millions of people around the globe. قد يكون الجهاز المناعي قادراً على **التغلب** على الفيروس الذي يفتك بملايين البشر حول العالم.
3	In the worst-case scenario, the disease's **trademark** fever and chills are followed by dizzying anemia, seizures and coma, heart and lung failure-and death. وفي أسوأ الأحوال فإن أعراض **المرض** الأكثر شيوعا من سخونة وقشعريرة يتبعها فقر دم حاد ونوبات إغماء وفشل في وظائف القلب والرئتين ثم الوفاة.
4	Your minds have **programmed** you against wealth and pleasure against things that make your eyes sparkle and your feet dance. لقد **برمجتكم** عقولكم ضد الثروة وبرمجتكم الملذات ضد الأشياء التي تجعل عيونكم تتلألأ وأقدامكم ترقص.
5	The patient is **full of** cancer. لقد **استفحل** السرطان في جسد المريض.
6	We must **get to the bottom** of the problem. علينا أن **نسبر أغوار** المشكلة.
7	After awaking his computer from its power-save **slumber** he copied the add-in from the disk back to the internal hard drive. بعد أن **قام بتشغيل** جهازه من وضع **السكون** الموفر للطاقة، قام بنسخ البرنامج الملحق من القرص الخارجي إلى القرص الصلب الداخلي.
8	Why think if the computer can do **thinking** for you? لماذا تفكر في حين يكون بمقدور الحاسوب **أن يفكر** نيابة عنك؟
9	The computer's **telling** them it's in stock. **يظهر** الحاسوب أن الأشياء متوفرة في المخزن.
10	"I've sent out so many resumes; I've **tired** my computer out," she said. قالت: « لقد **أجهدت** حاسوبي بإرسال العديد من السير الذاتية مراراً وتكراراً ».
11	And now a computer, a machine, is said to have **intelligence**. Well, if this is the case, how did the computer **feel** when it is lost? والآن يقال أن الحاسوب، الذي ليس سوى آلة من الآلات، يتمتع **بذكاء**. حسنا، إن كان الأمر كذلك، فكيف يشعر الحاسوب عندما يضل الطريق؟
12	Because Medicare still listed her as dead, the computer **refused** to issue her checks. **رفض** الحاسوب إصدار شيكاتها لأن نظام التأمين الصحي لا يزال يصنفها في عداد الموتى.
13	I loved my computer for its **friendly criticism** and the good **advice** it gave me. أحببت حاسوبي ل**نقده الودي وللنصائح** الصادقة التي قدمها لي.
14	Despite these improvements in vaccines, many microorganisms maintain their capacity to **outwit** the immune system. وعلى الرغم من هذه التحسينات التي أدخلت على اللقاحات، لا تزال العديد من الأحياء الدقيقة تحتفظ بقدرتها على التغلب على جهاز المناعة.
15	It's an **overwhelming** infection. إنها عدوى **متفشية**.
16	The body **defends** against cancer. **يدافع** الجسم عن نفسه ضد مرض السرطان.
17	We've **wiped** out smallpox. لقد **قضينا على** مرض الجدري.
18	This **sinister** disease requires a rigorous history to be taken plus a **searching examination** together with a high index of **suspicion** in order to spot **the tell tale clues** and make the correct diagnosis. **(medicine is a detective story)** يتطلب الأمر أخذ تاريخ دقيق للمرض الخبيث بالإضافة إلى إجراء فحوصات استقصائية مع مستوى عال من الاشتباه لتتبع الدلالات المريبة عن المرض، وتشخيص المرض تشخيصاً صحيحاً.
19	Enter the user name and **password** to open your router's configuration **webpage**. أدخل اسم المستخدم و**كلمة المرور** لفتح **صفحة الويب** الخاصة بإعدادات الموجّه الخاص بك.

(Contd...)

Appendix 2. (*Continued*)

No.	Translated sentences
20	The computer case, wiring, <u>**tools**</u> and machinery are examples of <u>**hardware**</u>. يعتبر جهاز الحاسوب والأسلاك <u>**والأدوات والمعدات**</u> أمثلة على <u>**الأجزاء الصلبة للحاسوب**</u>.
21	Antibodies are defending against this <u>**onslaught**</u>. <u>**تدافع**</u> الأجسام المضادة ضد هذا <u>**الهجوم**</u>.
22	Tinier "nanobodies," derived from camels and llamas, may be able to <u>**infiltrate**</u> a wider range of diseases at lower cost. قد تكون الأجسام النانوية المتناهية في الصغر والمشتقة من الإبل وحيوانات اللاما، قادرة على <u>**اختراق تحصينات**</u> طيف أوسع من الأمراض وبتكلفة اقل.
23	Infusions of blood-forming or hematopoietic, cloned stem cells might "<u>**reboot**</u>" the immune systems of people with autoimmune diseases. إن ضخ الخلايا المكونة للدم والمشتقة من الخلايا الجذعية المستنسخة قد <u>**يعيد اطلاق**</u> الأجهزة المناعية للمصابين بأمراض المناعة الذاتية.