

# Virtual Reality for Teaching ESP Vocabulary: A Myth or A Possibility

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## Abstract

Studies on the effects of various strategies to improve vocabulary have documented the important role of input and output in terms of long-term retention of lexical items. Nowadays, the world is witnessing a growing interest in wearable devices. Considerable attention has been paid specifically to virtual reality (VR) headsets or smart Goggles and their abilities to engage their users. This paper examined whether virtual reality headsets help (N=20) Saudi female ESP postgraduates enrolled in the Didactic Terminologies in English Course to retain vocabulary related to their field. For six weeks, the students interacted with virtual objects through watching 360 degrees videos related to basic skills in counseling and some cases that require consultation and referral. For example, depression, addiction, suicide, autism, violence, domestic violence, bullying, and impulsive behavior. A pre and a post tests scores were compared by a paired sample t-test to examine the effect of the virtual reality videos on their vocabulary retention. The results showed a highly significant difference between the two tests with a ( $P < 0.001$ ), and the mean scores between a pre and a post-tests pointed out that an alteration in favor to the post-test where students indicated the most improvement. The results demonstrated that virtual reality videos actually helped the postgraduate students to retain ESP vocabulary and therefore develop their competence level. Future work could investigate the perception of using virtual reality headsets to improve ESP vocabulary.

**Keywords:** Virtual Reality, Virtual Reality Goggles, English for Specific Purpose (ESP) , Vocabulary Retention, 360 degrees videos

## 1. Introduction

Involving the learners in mastering vocabulary strategies is an increasingly important area of investigation in language teaching. Over the past century, there has been a dramatic increase in studies that examined different techniques and suggested theories that claim providing insights in engaging the learners and helping them store and retrieve vocabulary. Some of these are constructivism, metacognitivism, contextualization, mind mapping, differentiation, spaced repetition, and interleaving practice. Moreover, some recent studies focused on examining the relationships between students' size of vocabulary and their reading comprehension (Ibrahim, Sarudin, & Muhamad, 2016; Sidek & Rahim, 2015). Others identified the types of learners based on their vocabulary learning strategies preferences (Mokhtar et al, 2009). Furthermore, the evolving but inconclusive literature drove Hunt and Beglar (2005) to suggest framework for developing vocabulary and Yousefi and Biria (2016) to propose meta-analysis to resolve the conflict. It also led Akeel (2016) to suggest corpus-based vocabulary in language testing.

Consequently, the emergence of the internet has not only revolutionized data, but also the way students engage their bodies and minds with the various visual and auditory content. Nevertheless, Kurt and Bensen claim the lack of more studies that support integrating technology in vocabulary teaching (2017). Also, in the ESP field, Khan (2016) pointed out that some students in vocational courses face difficulties in knowing and using vocational vocabulary terms in day to day professional life. This indicates a need to examine the newly emerged and constantly developed virtual reality (VR) softwares and test their abilities in transforming the way students learn ESP terminologies. The VR headsets designers and advertisers claim they could provide the users with chances to be exposed to authentic practical training without the need to leave the classroom.

Considering all of this and to the authors' knowledge, empirical investigation regarding integrating VR headsets to support ESP vocabulary retention is still lacking, specifically in the Saudi context. Such investigations would provide empirical validation of ESP vocabulary retrieval and mastery and thus leading to better language acquisition outcomes. Also, applying this new tool to teaching ESP vocabulary can be considered a shift to immerse the learners in the learning environment. This study also fills a gap in knowledge by contributing to vocational literature by investigating the use of Virtual Reality headsets to help postgraduates retaining ESP vocabulary related to Counseling and Guidance. This study aims to help ESP postgraduates boost their ELL level by providing recommendation for ESP educators to equip themselves with modern technologies. To this end, this paper examines whether VR headsets help Saudi ESP postgraduates enrolled in the Didactic Terminologies in English Course to retain vocabulary. The study attempts to answer the following question:

1. In classroom settings, are Virtual reality headsets considered effective tools to help ESP postgraduates retain vocabulary related to their field?

## 2. Literature on Conflict

### 2.1 Existing Research on Factors Affecting Learning ESP Vocabulary

Studying English for Specific Purposes (ESP) has been defined by many scholars but it can broadly mean learning English to be used in specific fields related to labour market, such as science, nursing, technology, and business. According to Hutchinson and Waters (1987) the term increased when the international development of commerce and technology, after the Second World War, required a use of a lingua franca to close business deals with the economically powerful United States. Since then, accommodating the instructions of ESP programs to learner's needs and interests has been the subject of many studies within the field.

Some of these studies documented a number of factors found to be influencing teaching English for vocational education. For instance, inappropriate instruction, students' vocabulary deficiency, lack of ESP teachers pre-service training, lack of courses' needs analysis, lack of ESP materials, students and teachers lack of functional academic literacy and field knowledge (Kavaliauskiene & Janulevieiene, 2001; Kavaliauskiene, 2003; Alsolami, 2014; Chostelidou, Griva, & Tsakiridou, 2009; Luo & Garner, 2017). In a recent study, Hoa and Mai (2016), categorized the factors into three main groups: (1) difficulties related to students; (2) difficulties related to teachers; (3) and difficulties related to environment and others. Similarly, Khan (2016) investigated difficulties faced by 76 working hospital professionals/trainees in knowing and using medical terms related to daily professional life. After attending a 15 hour professional development program in Jeddah-Kingdom of Saudi Arabia (KSA), the result of a questionnaire indicated most of the trainees faced difficulties mastering words related to their fields. Khan (2016) related the reasons to difficulties in English, Greek and Latin borrowing, difficult word-structure and lack of opportunities to practice medical terms. He suggested applying some strategies to assist students pursue self-learning via web resource and peer learning. Such suggestion informed this current study.

### 2.2 Possible Suggested Solutions

Numerous studies have attempted to investigate and recommend solutions. Specifically, recent studies on ESP vocabulary have urged researchers to place the focus on integrating new digital tools. For example, to compensate for the lack of communication with the native speakers, Kavaliauskienė and Kaminskienė (2010) reported learners' positive attitudes toward using eportfolios to learn ESP and thus foster sustainable lifelong learning. Similarly in Iran, Fazeli (2012) compared the result of teaching ESP materials through traditional text-with Web-based instruction. Her study revealed that 82 students majoring in Nursing at Shahid Beheshti Medical Sciences University had positive attitudes towards using the recommended online Nursing resources in their ESP learning. Also to provide teachers and students with a systematic way to incorporate role-play game into ESP learning, Fang-Chen Lu and Ben Chang (2016) developed a framework to enhance ESP vocabulary-acquisition. It contained three levels which are semantic sets, communicative sets and situational sets. Also to answer the call for ESP courses' needs analysis, Shing & Sim (2011) and Alhuqbani (2014) agreed that most ESP courses are ineffective, inappropriate, they lack needs analysis mechanism and

learners are only provided with an ad hoc language basis. They called for redesigning and reshuffling the ESP courses to meet the actual needs.

### *2.3 Vocabulary Retention*

Apart from all these suggested solutions, numerous studies and theories have attempted to explain the role of memory on vocabulary retention. Forgetting is part of retrieving information from memory (Lewis, 1999). Due to that and as mentioned earlier, much attention has been paid to techniques that help learners remember lexis encountered in course materials as well as improve the rate of vocabulary retention. Some studies documented the effect of word repetition on recycling vocabulary. For example, Heidari-Shahreza & Tavakoli (2016) and Chang (2011) examined learning vocabulary through repetition. The studies revealed repeating vocabulary increased the possibility of learning them and reducing the possibility of forgetting them. Chang (2011) further claimed that it is beneficial to expose words in context and repeat them as that triggers the short term memory to focus on meaning-making and eventually storing words in long-term memory.

### *2.4 Movies and 360 Degrees Videos*

In addition to investigating the role of memory in learning vocabulary, recently, movies and videos have been suggested to become integral parts of the curriculum as they proved to improve language skills (Yaseen & Shakir, 2015). The literature has documented the positive effects of integrating videos in English classes. Kusumarasyati (2004) highlighted that they effectively motivate learners and stimulate their imagination. In the Saudi context, Kabooha (2016) reported the positive attitudes of both Saudi English as a foreign language (EFL) learners and teachers towards the integration of English Youtube videos in their classes to develop students' language skills. Similarly, Yaseen & Shakir (2015) investigated the relationship between effective learning and students' movie preferences. The 20 students from Iraqi school at Kuala Lumpur-Malaysia revealed that they preferred to have Arabic subtitles to help them learn vocabulary while watching the movies. To support the use of subtitles, Zhu et al (2017) used VIVO movies for vocabulary learning and confirmed its advantage over the dictionary by a 30% increase in vocabulary retention. Moreover, Kurt's and Bensen's (2017) study reported that the practice of Vine videos improved participants' vocabulary. The results of the post-test and the content analysis of the semi-structured interviews revealed that participants' enjoyed the experience and were motivated.

Although extensive research has been carried out on the impact of videos on EFL, much less is known about the impact of the new immersive videos or the 360 degrees videos in retaining ESP vocabulary. According to Bao et al (2016) the content of immersive videos increased rapidly the past few years due to the emergence of VR tools. To create 360 degrees videos, a collection of cameras or an omnidirectional camera are needed. Images of real-world panorama are recorded from different angles then joined together to form 50 or 60 frames per second using a software. With a resolution of 6K instead of 4K, the different directions of the video can be viewed using head mounted display (HMD) or VR tools (Bao et al, 2016; Budagavi et al, 2015).

## 2.5 *Virtual Reality*

Throughout this paper, the term VR has been used to refer to Virtual Reality environments. Virtual Reality environments are not new but the term has broadened recently. Freina & Ott (2015) proposed that it originates from the early 60s and that it is of two kinds which are: a) immersive and b) non-immersive. Immersive VR uses additional tools such as (HMD) or the new VR goggles. These tools help presenting an artificial environment using sounds, 3D images, or other stimuli to give the impression of “stepping inside” a non-physical world. Non-immersive VR uses computer to generate imaginary or real places.

Virtual reality environments have been experienced through different channels in the past by a) joysticking and keypressing to move a videogame character, b) swinging physically when using the Nintendo Wii control to play a game, or c) recently tapping and zooming a smart screen to navigate and view different angles (Fox et al., 2009). The key element that distinguishes the virtual reality is the user’s ability to track the movement when wearing the VR tools and hence display different dimensions of surroundings.

To enrich the VR content and ensure a deeper feeling of immersion, different companies released lately new wearable devices in the markets such as Google cardboards and Samsung gear VR. A number of studies have postulated that this new wave of gadgets can replicate the classroom learning environment if not revolutionize it. Also, current studies report that many current young students might work in new fields that do not exist now. Based on the premise that VR may transform the learning experience, in higher education setting, Merchant et al (2014) conducted a meta-analysis of 69 studies to examine three forms of desktop-based VR instructions (i.e. games, simulation, virtual worlds) . Overall, the study revealed that virtual-reality based instruction was effective and it can enhance learning outcomes. It also reported a need for adequate statistical information to understand effect sizes. Also, Jung et al (2012) stressed the effectiveness of VR tools that simulate the touching sense for practical exercises for a nursing course.

Until now, most studies in integrating VR have only been carried out in disciplines such as medicine, military, and nursing (Rosenthal et al, 2008; Rizzo et al, 2015; Bertram, Moskaliuk, & Cress, 2015). However, very little is known about integrating VR goggles in teaching ESP vocabulary specifically in the Saudi context. Therefore, in view of all that has been mentioned so far, one may understand that although videos proved to be great source of enhancing language learning, there remains a paucity of evidence on their abilities to encourage ESP learners deepening their knowledge of terms and issues related to their fields. With the problems of teaching ESP vocabulary discussed above, most of the studies the authors evaluated have failed to specify whether videos can immerse viewers in real-life application to maximize ESP vocabulary retention. Specifically that some ESP programs require training which can be difficult and dangerous at times as they require dealing with emotional, vocational, and health-related issues. To adjust the Counseling Psychology curriculum to match ESP postgraduates’ needs, this current study seeks to obtain data related to Virtual Reality application in an ESP classroom which will help to address this research gap.

The study attempts to answer the following question:

- 1- In classroom settings, are Virtual reality headsets considered effective tools to help ESP postgraduates retain vocabulary related to their field?

The data was used to investigate the following null hypothesis: postgraduate students will not retain ESP vocabulary after virtual reality headsets intervention.

### **3. Methodology**

#### *3.1 Participants*

A sample of (N=20) Saudi female ESP postgraduate students ranging between 23 to 35 years old participated in the current research. They were enrolled in the Didactic Terminologies in English Language Course. This course was the only English course available in the master of Counseling and Guidance conducted during the second term of the students first academic year. The master of Counseling and Guidance is an Arabic based program offered by the Department of Psychology at King Abdulaziz University, Jeddah, Saudi Arabia.

To get a general background about the participants, the demographic information were collected prior to the experiment. Their English language background ranged between beginners to advanced as determined by their TOEFL iBT and IELTS tests scores. The only English language they received was during either their high school education or their first foundation year at the University. They were instructed for about 14 weeks at the rate of three hours a week. The students' major during their undergraduate education varies from Chemistry, Biology, Psychology, Nursing and Child development, and Counseling. Additionally, they all indicated that this is their first time to use the virtual reality headsets for educational purposes.

The purpose behind the assigned Didactic Terminologies in English Language Course was to provide students with a list of essential ESP vocabulary related to their field of research in psychology and Counseling. In addition, by the end of the course the students were supposed to have the knowledge of the vital vocabulary in their area which enables them to find English recourses related to their major and scientific interest.

#### *3.2 Instruments*

Merchant et al (2014) reported a need for an adequate statistical information in order to see the effect size of the new VR tool on English language learning. Therefore, a quantitative research design was employed to this study to quantify the effects of the VR smart goggles intervention on the postgraduate student's ESP vocabulary retention. A systematic experimental inquiry can also lead to the discovery and development of new intervention to be implemented in the English classroom.

To collect the data, a one-group pre-posttest design was employed. The researchers had only one group as both experimental and control, due to the limitation of the course availability as no other group was taking the same course in the same academic year. Marsden & Torgerson

(2012) highlighted some methodological concerns that may affect the results of such design such as maturation, test effects, statistical regression to the mean (RTM), contemporaneous effects of innovations in practice. Also, the literature documented other factors such as data collection bias, subjects' attitude, and implementation problems. To avoid that and to strengthen the data collected, normality test was obtained to either use paired sample t-test, if data is normally distributed, or Wilcoxon test, if data is non-normally distributed. The results section below will illustrate that.

Also, it is important to mention that even though the experiment was conducted by one of the researchers as their class teacher, the students were given a consent form to sign before the data collection procedure. They were clearly notified that their participation in the experiment is completely confidential and that they were free to withdraw at any time from the research. Also, they were informed that their results in the experiment would not affect their course grades in anyway. The participants did not have any special treatments, benefits, or money for agreeing to participate in this study.

The pre and posttests were designed by using the free online game tool "Kahoot" to produce not only a test for an experiment but a fun game-like learning atmosphere. The researchers created a test by using [www.getkahoot.com](http://www.getkahoot.com) which consisted of 50 multiple choice ESP vocabulary question items. They were selected from the course's and instructor's archives. The duration of the tests lasted for about 50 minutes, around 60 seconds per question. The teacher asked the students in class to open the link <https://kahoot.it/>, by using their smartphones, and enter their usernames and the game pin produced. The class instructor then navigated the pre and posttests to make sure that all the students entered both tests and stated an answer.

### *3.3 Procedures*

The study was conducted during the second term of the academic year of 2017. The implemented experiment lasted for six weeks at the rate of one hour a week. After a brief orientation, the postgraduate students interacted with VR objects through watching immersive 360 degree videos related to basic skills in counseling and some cases that require consultation and referrals such as depression, addiction, suicide, Autism, violence, domestic violence, bullying, and impulsive behavior. The list of vocabulary were not pre-taught to the students before conducting the pre-test. The main reason was that the study targeted testing the students' ability to master and retain 50 ESP vocabulary items after applying the virtual reality headsets intervention.

The virtual reality headsets used for this experiment is made of durable lightweight plastic with comfortable padding around the eye area, and a removable sled for adding the smartphone. The sled is adjustable to any smartphone size and brand which make it convenient for all the students to use. An adjustable elasticized strap holds the glasses firm in place and makes it comfortable to wear.

A number of ten VR headsets were provided to the students in class. The students were instructed to pair up to open a particular 360 degrees video related to the course curriculum

on YouTube, press on the cardboard glasses icon, remove the sled out of the glasses to place their smartphones, and then slot back in to the goggles to enjoy the immersive 3D viewing experience. Students also used their own headphones for more interactivity. After that, the students were asked to discuss what they watched in pairs and then share their views with the whole class.

#### 4. Data Analysis and Results

In order to examine the difference between the pre-test and post-test results mean, the data were analyzed by using the 21<sup>st</sup> version SPSS software package.

The pre-test was conducted before the mediation then after six weeks the same test was given as a posttest, the gap between the two tests was important to ensure for the validity of the experiment. In addition, to confirm the reliability of the current experiment test, Cronbach's Alpha reliability statistics test was used for testing the 50 ESP vocabulary question items. Results from Table (1) shows that the test score of Cronbach's Alpha is 0.893 which indicates that the test is highly reliable.

Table 1. The Cronbach's alpha reliability statistics test.

In Cronbach's Alpha	N of Items
0.893	50

The results of the normality tests are shown in table (2). For large dataset of more than (N=2000) participants, the Kolmogorov-Smirnov test should be used, otherwise for smaller dataset Shapiro-Wilk test should be applied. In the current study, since the dataset contains only (N=20) Saudi female postgraduate students, the Shapiro-Wilk test was used. It was found that the p-value is (p= 0.448) for the pre-test and (p= 0.099) for the post-test which are not significant for both. This indicates the acceptance of the alternative hypothesis and concludes that the data comes from an approximately normal distribution. Based on the normality tests results, paired sample t-test then was applied. To measure student's vocabulary retention before and after the VR headsets intervention.

Table 2. Tests of Normality

	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Pretest	.117	20	.200*	.955	20	.448
Posttest	.188	20	.062	.920	20	.099
*. This is a lower bound of the true significance.						
a. Lilliefors Significance Correction						



Table (3) illustrates the descriptive statistics of English for specific purposes (ESP) vocabulary pre and posttests score mean for counseling and guidance postgraduate female students, department of psychology. Results shows that the mean of the pre-test score is (32.00 ± 8.0328 ), and the mean of the post-test is (39.800 ± 6.5261), the mean is statically different when p-vale is calculated using a dependent samples t-test (P< 0.001) see Figure 1.

From coefficient of variation (C.V) it is clearly shown that the students results difference are larger in the pre-test (25%) comparing with the results in the post-test (16.4%) indicating an improvement in the students competence level.

Table 3. English for specific purposes (ESP) vocabulary pre and posttests score mean for counseling and guidance postgraduate female students, department of psychology. Paired samples statistics.

		Mean	N	Std. Deviation	Std. Error Mean	C.V	P Value
Pair 1	Pretest	32.000	20	8.0328	1.7962	25.1%	-
	Posttest	39.800	20	6.5261	1.4593	16.4%	0.001

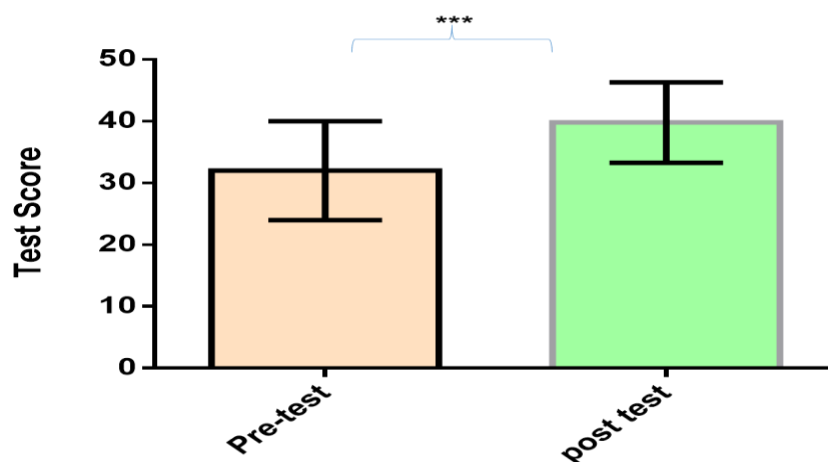


Figure 1. English for specific purposes (ESP) vocabulary pre and post tests score for counseling and guidance postgraduate female students, department of psychology. Each value expressed as mean±SD of each groups (n=20). Statistically significant differences determined by paired t-test (\*\*\* P< 0.001).

Table (4) also notes that the correlation between the two tests is estimated at ( $r = .645, p < .001$ ) suggesting that the dependent samples t-test is appropriate in this case. The null hypothesis of equal tests means is rejected, ( $t(19) = -5.548, p < .001$ ) (Appendix 1). Thus, the post intervention test mean is statistically significantly higher than the pre intervention test mean.

Table 4. Paired sample correlations

		<i>N</i>	<i>Correlation</i>	<i>Sig.</i>
<i>Pair 1</i>	<i>Pretest &amp; Posttest</i>	20	.645	.002

## 5. Discussion and Conclusion

As mentioned in the literature review, very little is known about the effect of the new immersive 360 degrees videos on ESP vocabulary retention. This present study was designed to investigate whether virtual reality headsets are effective tools to help ESP postgraduates retain vocabulary related to their field. The most interesting finding this research indicated is the significant difference between the pre and posttests and a rejection of the null hypothesis with a ( $P < 0.001$ ). Also, the mean scores between the pre and the posttests pointed out an alteration in favor to the posttest where students indicated the most improvement. The coefficient of variation (C.V) also showed that the student's results difference were larger in the pretest (25%) in comparison with the results in the posttest (16.4%). For instance, a student who scored only 18 in the pretest scored a significant 40 in the post-test, posing a major difference of 22 marks between the two tests. More details are included in the Appendix 2. These findings may help us to understand that VR videos actually helped the postgraduate students to retain ESP vocabulary and therefore develop their competence level. These results are in accord with Zhu et al (2017) study that indicated videos have the potential to increase vocabulary retention. However, caution must be applied as the findings cannot be extrapolated due to the small sample size.

Moreover, one unanticipated finding was that two students scored almost no improvement in the posttest results after the intervention. The reason behind that can be related to their critical medical conditions during the assigned time of the posttest. One of the students was nine month pregnant and very close to her due date while the other was diagnosed with very low blood pressure and was one week absent in intensive care. It may be the case that these variations of being in serious conditions during the posttest had negatively affected their results. It is possible to hypothesize that such health related issues are less likely to occur in other future studies.

Lastly, it is important to highlight that this study answers the recent call to integrate new emerging e-tools in the ESP learning environment specifically the immersive 360 degrees videos. It also addresses the need of adequate statistical information, as Merchant et al (2014) suggested, to understand the effect size of the new VR headsets on language learning. To respond to Khan's (2016) call for pursuing vocational self and peer -practical training via web resource, the results of this quantitative study also further corroborates the idea of testing VR softwares abilities in providing practical training by immersing the ESP students in real world situations, discuss and share views and hence transform the way they learn vocational terminologies. Likewise, such results provide an exciting opportunity to advance our

knowledge of integrating VR tools in language learning.

As indicated earlier, the results of this empirical study cannot be generalized as they were only based on data collected from (N=20) Saudi female ESP postgraduates. Also, due to Saudi social and cultural considerations, it was hard to include male participants. Therefore, future studies are highly recommended to compare males and females tests achievements in different schools as well as countries for more complex statistical analyses. To develop a full picture, future studies of VR goggles should consider investigating the perception of ESP students and the factors influencing their perception. Besides, with the lack of rich ESP virtual videos and difficulties encountered finding some related to Psychology, Child development, and Counseling content, more ESP 3D videos and guidance are required to enhance the use of VR headsets. Further work is also needed to establish the viability of VR headsets in enhancing other ESP language skills.

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## Appendix

### Appendix 1. Paired Sample Test

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pretest - Posttest	-7.8000	6.2878	1.4060	-10.7428	-4.8572	-5.548	19	.000

### Appendix 2. Differences of Marks between pre and post-tests

Pre-test	Post-test	Difference
18.00	40.00	22.00
30.00	43.00	13.00
45.00	43.00	-2.00
21.00	31.00	10.00
38.00	44.00	6.00
21.00	31.00	10.00
27.00	35.00	8.00
30.00	29.00	-1.00
27.00	31.00	4.00
34.00	43.00	9.00
34.00	36.00	2.00
27.00	43.00	16.00
27.00	44.00	17.00
46.00	49.00	3.00
31.00	32.00	1.00
35.00	41.00	6.00

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38.00	50.00	12.00
32.00	43.00	11.00
47.00	49.00	2.00

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