Article

The Effect of Multiplayer Video Games on Incidental and Intentional L2 Vocabulary Learning: The Case of *Among Us*

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Abstract: Vocabulary learning has been traditionally considered central to second language learning. It may take place either intentionally, by means of deliberate attempts to commit factual information to memory, or incidentally, as a consequence of other cognitive processes involving comprehension. Video games, which have been extensively employed in educational contexts to understand lexical development in foreign languages, foster both exposure to and the production of authentic and meaning-focused vocabulary. An empirical study was conducted to explore the effect of playing an online multiplayer social deduction game (i.e., a game in which players attempt to uncover each other's hidden role) on incidental and intentional second language (L2) vocabulary learning. Secondary school pre-intermediate English as a Foreign Language (EFL) students (*n* = 54) took a vocabulary pre-test that identified eight unknown words likely to appear in the video game *Among Us*. Then, students were randomly assigned to different groups of players and to different learning conditions—within each group, half of the players were given a list of phrases containing such target words, which they were encouraged to meaningfully use in the game by means of written interaction. In doing so, students learnt some target words intentionally and provided contextualized incidental exposure to other players. They took a vocabulary test after two sessions of practice with the game to explore intentional and incidental L2 vocabulary learning gains. The pre- and post-tests suggested, among other results, that players using new L2 words in the game *Among Us* would retain more vocabulary than players only encountering them, that vocabulary intentionally input helped other users trigger incidental vocabulary learning, and that repetition had a positive effect on L2 vocabulary learning.

1. Introduction

Vocabulary learning has attracted a great deal of attention in Computer-Assisted Language Learning (CALL) research [1]. Following a growing interest in video games as potential tools for teaching and training, different CALL studies have focused on the effect of digital game-based learning (DGBL) on language gains [2]. Research has attempted to understand lexical development in second or foreign language (L2) scenarios [3]. In addition to L2 learning possibilities afforded by DGBL, video games may be used to monitor progress and track gaming data in order to predict learning outcomes [4]. Such information provides researchers with opportunities to understand their effect on cognitive processes such as the learning of vocabulary in a foreign language.

1.1. Vocabulary Learning and Acquisition

Vocabulary acquisition has been traditionally considered central to second language learning. Rivers [5] states that it is vocabulary, rather than grammar, that is needed to get meaning across in basic communicative competence contexts, and McCarthy [6] suggests that it is words, independently of grammar or syntax, that conveys meaning and therefore

communicates ideas. As Chambers [7] points out, vocabulary learning is sine qua non to language learning, without which communication is bound to be unsuccessful [8]. More recent studies suggest that second language learning is largely dependent on vocabulary [9] and that 'learners need large vocabularies to successfully use a second language, and so high vocabulary targets need to be set and pursued' [10]. The rich body of literature about different techniques for vocabulary learning include the study of aspects such as noticing, retrieval and generative use [10,11]. Learning new vocabulary involves not only familiarizing with the meaning of a word but also with its spelling, grammatical category, pronunciation, and collocations. Although the process of vocabulary learning is incremental, there is a common concern about its effectiveness as it 'is boring and demands conscious concentration on the key nuances of meaning; however, the learning outcomes are often unsatisfactory due to the decline of memory retention over time' [12]. In this sense, motivation and engagement play a major role for effective learning [13].

Conventionally, research distinguishes between intentional and incidental vocabulary learning. The first one is an explicit process that requires learners' awareness and deliberate effort, whereas the second is considered to be unintentional and, as such, can be better termed as acquisition [11,14]. In other words, 'incidental acquisition or learning is [. . .] spontaneous, and non-deliberate, while intentional learning takes place when there is a purposeful goal of learning the TL and its components' [15].

Incidental and intentional are often portrayed as opposed, conflicting approaches to vocabulary building, and studies typically revolve around exploring which is more effective, thus failing to explore how both may intertwine in the learning of new vocabulary. According to Laufer [16], explicit vocabulary activities increase performance better than incidental learning both in the short and in the long run. Elgort [17] posits that an intentional approach to vocabulary is more effective since it does not require a natural setting, and Ahmed [18] highlights the efficacy of intentional learning over incidental learning in terms of retention. Conversely, Hulstijn and Laufer [19] claim that words encountered in incidental settings are retained longer, whereas Karami and Bowles state that incidental vocabulary learning is more effective than intentional vocabulary learning, although "a combination of both may make a perfect strategy" [20], which is in line with Schmitt, who suggests that "perhaps the most effective way of improving incidental learning is by reinforcing it afterwards with intentional learning tasks" [10].

In addition, the existence of a correlation between exposure to new words and learning gains seems to be a common notion [10,11,21,22]. According to Choo et al. [23], 'the absence or presence of a learning intention does not play a decisive role as vocabulary acquisition is first and foremost determined by the nature and frequency of the processing of new words'. However, as Barcroft states, it is highly complicated to identify the number of times a learner encounters a new word, claiming that, as a consequence, 'both lack of focused attention and lack of controlled presentation pattern are commonly critical differences that appear with incidental as compared to intentional vocabulary learning' [22]. As a consequence, frequency, meaning the number of times new words may appear in the input, has become one of the most studied aspects in vocabulary learning.

1.2. Digital-Game Based Vocabulary Learning

Video games have been extensively employed in L2 learning since they replicate real-life conditions [24,25] and provide 'sheltered contexts for controlled exposure to, and practice with, input that may be repetitive and redundant' [26], which 'increase[s] student enthusiasm, lower[s] anxiety, and improve[s] willingness to communicate' [27]. Several reviews on digital game-based vocabulary learning (DGBVL) have been published to date [12,28]. Studies have mostly focused on the supplementary role of digital games to formal vocabulary instruction [29], although language acquisition research has ignored by and large 'any possible role that digital gaming may play in the incidental acquisition of vocabulary' [30]. Educationally, DGBVL has been found to enhance learner motivation and engagement as well as to promote higher interaction and autonomy [29,31,32].

Linguistically, DGBVL has been demonstrated to be effective for contextual and collaborative learning and negotiation of meaning [33–35]. Furthermore, digital gaming may also be used to strengthen in-game and out-of-game community practice and facilitate language socialization [12].

Most DGBVL studies focus on receptive rather than productive word knowledge and on short-term rather than long-term retention [36]. Yet, there are some examples of research on both receptive and productive levels [37,38] and on long-term retention [39,40]. Some of these studies delved into the affordances of educational games, also known as serious games [41], highlighting positive effects on learning such as enhanced student motivation and engagement. However, Chiu et al. [42] reviewed 14 studies to investigate the effectiveness of digital game-based vocabulary learning and identified a bias depending on the effect size, since 'studies reporting significant results and larger effect size are more likely to be published', claiming also that 'only a few studies were found to utilize meaningful and engaging games for language learning' (p. 106). Research on the effects of commercial games on incidental vocabulary learning is comparatively scarce and inconclusive. Sundqvist [37] examined the relation between playing commercial-off-the-shelf (COTS) games and L2 English vocabulary and found a positive correlation between the learners' tests scores, time played, and types of games played, revealing significantly higher scores for gamers (compared with non-gamers). Zou and Xie [12] analyzed the results of ten different types of games (simulation, tutorial, role playing, motion sensing, 3D virtual, adventure, card, board, and serious games, as well as gamified digital books) in 21 publications included in the Social Science Citation Index, concluding that digital games promote effective vocabulary learning, enhanced interaction, and increased motivation. Similarly, Rasti-Behbahani [43], in a systematic review of 167 papers on DGBVL, analyzed certain factors such as motivation, authenticity, instantiation, repetition, interactivity, control, and dual encoding and concluded that 'digital games can supply learners with a rich context that offers many opportunities for effective vocabulary learning' (p. 116).

The research interest in DGBVL has grown parallel to the expansion of commercial games and the rising number of players thanks to the worldwide penetration of smartphones and tablets and the new interactive opportunities they offer. According to Reynolds [30], the preference for off-the-shelf games may be partly due to the 'incorporation of a communicative element in which players exchange information during conversational turn taking and make adjustments to negotiate meaning, a process necessary for language acquisition'. Within this field, there has been an increase in studies about the use of game-based mobile apps (GBMAs) for vocabulary learning, although most of these games have been specifically designed for language learning and not for pleasure and entertainment [44,45]. Everything considered, this paper aims to examine the effectiveness of the online multiplayer social game *Among Us*, which has attracted large numbers of gamers and streamers across the world, on intentional and incidental vocabulary learning.

1.3. The Game Among Us

Among Us is a free online multiplayer game which has gained worldwide popularity over the last three years, as evidenced by the 350 million downloads reported in 2020. This success was partly due to famous Youtubers and Twitch streamers who popularized it, particularly during the COVID-19 pandemic and subsequent quarantine [46]. In this game, action takes place in a spaceship called 'The Keld', where four to 10 players are randomly chosen to be either crewmates or impostors in short rounds. Impostors, one to three depending on each round, can close doors to limit movement and win if they kill enough crewmates to be equal in number or if the latter fail to resolve a major sabotage. On the other hand, the crewmates can win if they identify and eject all the impostors or complete all the assigned tasks in the form of minigames. After finding a dead body, a player may call for an emergency meeting, in which all players discuss any suspicious behavior in a built-in text chatroom and vote on who they believe the impostor/s are. However, the impostors can also accuse other players. After voting, the chosen player/s are ejected

from the map and become ghosts. Gameplay can be to a certain extent customized in relation to the number of emergency meetings and tasks along with certain spacesuit features such as colors, hats, skins, etc. This cross-platform game has been already used in some educational areas because of its functioning in the form of short-term sessions or rounds, flexibility, and socialization opportunities. For example, Limmanee [47] employed *Among Us* in the context of law and criminology as an example of online game streaming and casting, while Earle [48] used it as a social deception game to promote interpersonal communication and group cohesion in an online class environment thanks to its popularity among young learners.

In language learning, York [49] explains how to use *Among Us* to teach languages with different purposes such as speculating, persuading, asking questions, or giving and receiving advice, and they provide a step-by-step procedure about how to integrate the game from a Task-based Language Teaching and Learning (TBLT) approach, proposing different tasks such as discussing via text-based communication, using common slang and abbreviations (e.g., sus(picious), bro(ther), AFK (Away from Keyboard)), translating the map locations or getting involved in an online community. The author states that the game can be integrated in language education in order to learn target vocabulary from an Interactionist Approach (IA), for example, by accusing or backing up fellow players, giving convincing arguments, persuading, and reflecting 'on the gameplay experience with other classmates as a lived, embodied, hopefully FUN experience' (p. 272). York, who suggests pairing the gameplay with other communication applications (Discord, Skype, or Zoom) in a synchronous voice chat platform, also refers to the frequency factor, since players in this game use similar expressions multiple times and have the chance to build a repertoire of formulaic expressions of the target vocabulary over repeated game sessions (p. 273).

Similarly, Frazier [50] highlights the educational benefits of *Among Us*, points out that other guessing games such as *Mafia* and *One Night Ultimate Werewolf* have been previously used in the language classroom with success, and reports a practical example about how she used the game to increase motivation among English language learners in synchronous and asynchronous modes. The author employed it to teach students how to make substantiated claims based on scenes from the play by using guided expressions such as 'Who did you see? Where did it happen? What were you doing?'. Some of the affordances reported are higher interaction and student engagement, enhanced sense of community, and enjoyment in online instruction, although the author recommends scaffolding the gameplay in order to provide language examples in advance, as it is extremely fast-paced. Despite the wide popularity of *Among Us*, a good amount of the articles previously mentioned are based on recommendations about how to integrate the game in the language classroom, but no empirical research to date has been published about the effects of adopting it for vocabulary learning. Therefore, this paper attempts to examine its effectiveness on the learning of target words, both intentionally and incidentally.

2. Current Study

While there is little doubt about the effectiveness of intentional vocabulary learning [10,11,51–53], incidental vocabulary learning is the source of a more heated debate, in which learner-related factors such as age or gender [54] and text-related factors such as repetition or term saliency [55] are believed to play an important part. In addition, although the effect of video games on incidental vocabulary development has been investigated to a certain extent, few studies explore whether they may afford the learning of vocabulary through an intentional approach. This is partly because although video games allow for interaction, unlike other media traditionally deployed in vocabulary learning settings such as films or books, user input is not typically uttered, either in oral or written form, unless when played online with other users as in the case of *Among Us*. Finally, while it is a common notion that word exposure frequency influences vocabulary acquisition, it is less clear how it affects the learning of vocabulary that goes on in digital game-based learning scenarios,

and whether vocabulary input provided by students intentionally may help other peers trigger incidental vocabulary learning gains.

Based on the literature review, the questions 'Is incidental vocabulary learning more effective than intentional vocabulary learning in digital game-based scenarios?' and 'What are the factors that affect both intentional and incidental vocabulary learning in digital game-based scenarios?' were explored. In the hope of addressing them, the hypotheses of the study were formulated as follows:

Hypothesis 1 (H1). *Players using new L2 words in the online multiplayer social deduction game Among Us retain more vocabulary than players only encountering them.*

Hypothesis 2 (H2). *The more times a word is encountered by a student in the online multiplayer social deduction game Among Us, the more likely it is to be learnt.*

Hypothesis 3 (H3). *The more times a word is intentionally used by a student in the online multiplayer social deduction game Among Us, the more likely it is to be learnt.*

Hypothesis 4 (H4). *Factors such as gender and L2 proficiency are predictors of digital game-based vocabulary learning.*

3. Method

3.1. Sample

The participants for this study were 54 Spanish students of English as a Second Language from the first year of *Bachillerato* (11th grade), holding on average an elementary level of English, as determined by testing. In total, 29 female and 25 male students aged between 16 and 18 ($M = 16.57$, $SD = 0.633$) participated in the experiment.

3.2. Target Items

Prior to the beginning of the experiment, the researchers took part in real, non-controlled, online game plays of the game *Among Us* with other users for about ten hours in multiple sessions and identified twenty terms in different game situations which were deemed to be of a slightly higher level than that of the students, as determined by testing: *chase, deplete, engine, fix, follow, fuel, ladder, lie, perform, positive, proof, reckon, refrain, skip, storage, suspicious, task, vent, wires,* and *witness*. In order to identify which of these L2 terms were actually unknown to the participants in the study, they took a test consisting of writing sentences for each of them in a way that their meaning would be made clear. For the purposes of the study, vocabulary knowledge means productive knowledge and entails a degree of knowledge that shows that participants are able to use the L2 words and understand their general or intended meaning, as opposed to mere receptive knowledge, which is typically tested by means of multiple choice or matching activities. Following assessment of the tests, eight terms were identified as unknown to all of the participants and were thus selected as target words in this study: *deplete, fix, ladder, perform, positive, reckon, refrain,* and *witness*.
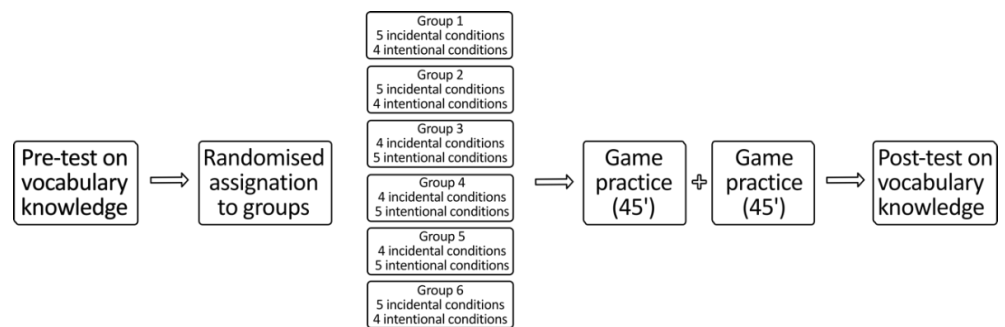
3.3. Procedure

The experiment was carried out in four sessions in two different weeks at a secondary school in Elche (Spain). Prior to the beginning of the study, participants were asked to download *Among Us* onto their devices and explore how it works to minimize technological issues in connection with the operation of the game. In the first session, students from the core module *English Language*, which is taught three hours per week on three different days, were asked to individually complete a paper-based knowledge test on the aforementioned twenty terms identified by the researchers as both suited to the students' level of English and likely to be used in the game. Thus, students were asked to provide a meaningful sentence that would illustrate the meaning of each of the different words. Namely, the instructions read 'For each of the following words, write a sentence that makes its meaning clear'. In order to determine their English skills, students also took the General English lan-

guage test (from https://www.cambridgeenglish.org/test-your-english/general-english/ accessed on 26 February 2021) consisting of 25 questions, as previous research suggests that language proficiency has an effect on language learning gains [56] and identifies positive correlations between L2 vocabulary skills and video game playing [57,58]. Following completion of the test, the game *Among Us* was introduced, although the majority of students were familiar with it and stated that they played it regularly. Then, students were randomly assigned to two different conditions (incidental and intentional). Those in the intentional condition were given a sheet of paper containing the twenty terms along with a sentence likely to be in the game *Among Us* (see Appendix A), and they were encouraged to review the terms at home and use them during class practice with the game, which took place the following week. In the next two sessions, taking place in consecutive days, students were divided into six different groups and were allocated into different virtual game rooms of nine players each (plus one external collaborator, who was in charge of setting up and providing access to the rooms, tracking target items, and supervising smooth functioning of the activity). Each group comprised four/five students from the intentional condition and five/four students from the incidental condition. In total, there was an equal number of students aiming to use the target items and students coming across them incidentally. The game settings were adjusted to foster interaction—as Figure 1 shows, discussion and voting time was set to a total of one hundred and fifty seconds to discuss who the impostors might be. Such interaction took place in written form and, as already mentioned, students from the intentional condition, whom had been encouraged to use the target items when possible, contributed to it as frequently as they could. Overall, students were able to play for about forty-five minutes each session, totaling up to approximately ninety minutes of practice with the game. In the fourth session, which took place two days after the third, students took the paper-based knowledge test on the eight target items to identify any learning gains, as Figure 2 shows. To avoid extraneous variables, the post-test also consisted of providing meaningful sentences for each of the different target items, terms were arranged in a different order, and students were told not to use sentences replicating those from Appendix A. In addition, right answers were not made available nor was any type of feedback provided regarding students' responses at any stage.


Figure 1. *Among Us* waiting room and game settings.

Figure 2. Procedure.

3.4. Data Collection and Analysis

The fifty-four participants in the study were divided into six groups, which led to different written interactions between those having to use the target items intentionally and those coming across them incidentally, as Figure 3 shows. The external collaborators kept a record of the target items used and of which of the participants from the intentional condition used them. They also were in charge of supervising smooth functioning of the activity but did not interact verbally with the students during gameplay. In line with the hypotheses of the study, data regarding the number of times (i) students from the intentional condition used the target items ($M = 11.15$, $SD = 3.810$), along with their vocabulary learning gains ($M = 5.19$, $SD = 1.145$) and proficiency in English ($M = 9.07$, $SD = 1.979$), and (ii) students from the incidental condition came across the target items ($M = 49.85$, $SD = 3.290$) was collected, along with their vocabulary learning gains ($M = 2.44$, $SD = 1.340$) and proficiency in English ($M = 8.85$, $SD = 2.583$). For the purposes of this study, L2 vocabulary learning was construed as the number of target items for which students could provide a meaningful sentence that would illustrate their meaning in the post-test. In addition, a single independent rater scored all of the tests in order to guarantee reliability of the grades.
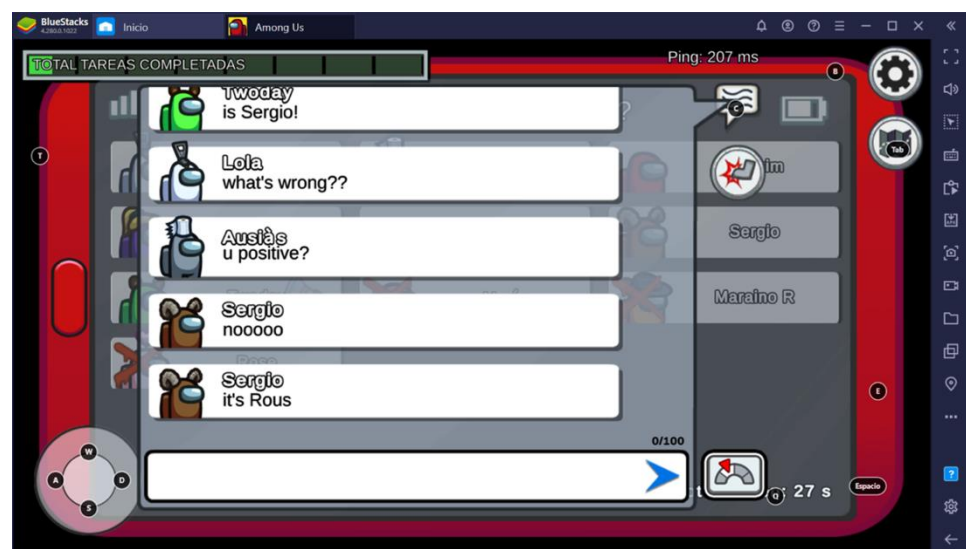
Figure 3. Written interactions in the game *Among Us*.

An independent samples *t*-test was performed to ascertain whether there were any differences in the learning of the target items between students using them intentionally and those coming across them incidentally. In addition, correlational and linear regression analyses were carried out in order to evaluate whether any of the measured variables could account for any between-subject differences in L2 vocabulary learning. First, bivariate correlations were computed to explore relationships between variables. Several statisti-

cally significant correlations, which are presented in Table 1, were found, leading up to multivariate linear regressions, which aimed to look into the predictive strength of (i) the number of times students use a target item in the game *Among Us* (*intentional learning*), (ii) the number of times students come across the target items (*incidental learning*), and (iii) students' L2 skills (*English proficiency*) on the learning of such target items. Eventually, gender was not included in the multiple regression analyses since, as Table 1 shows, the correlational analysis suggested there is no interaction between this variable and learning outcomes owing to written interaction in the game. These analyses were performed using the SPSS 22.0 statistical software with the significance level set at 0.05. In addition, key assumptions of the linear regression model (normality, linearity, homoscedasticity, and absence of multicollinearity and autocorrelation) were checked and confirmed using the approach recommended by Baños, Fonseca, and Álvarez [59].

Table 1. Correlation between measured variables.

		Gender	Age	Method	English Profic.	Terms Learnt	Terms Used	Terms Seen
Gender	Pearson Correlation	1	−0.038	0.186	−0.015	−0.235	−0.209	0.059
	Sig. (2-tailed)		0.783	0.179	0.913	0.087	0.130	0.670
	N	54	54	54	54	54	54	54
Age	Pearson Correlation	−0.038	1	0.030	−0.312 *	−0.213	−0.100	0.017
	Sig. (2-tailed)	0.783		0.832	0.022	0.121	0.474	0.904
	N	54	54	54	54	54	54	54
Method	Pearson Correlation	0.186	0.030	1	−0.049	−0.746 **	−0.904 **	−0.097
	Sig. (2-tailed)	0.179	0.832		0.724	0.000	0.000	0.484
	N	54	54	54	54	54	54	54
English profic.	Pearson Correlation	−0.015	−0.312 *	−0.049	1	0.489 **	0.205	0.160
	Sig. (2-tailed)	0.913	0.022	0.724		0.000	0.138	0.247
	N	54	54	54	54	54	54	54
Terms learnt	Pearson Correlation	−0.235	−0.213	−0.746 **	0.489 **	1	0.800 **	0.198
	Sig. (2-tailed)	0.087	0.121	0.000	0.000		0.000	0.150
	N	54	54	54	54	54	54	54
Terms used	Pearson Correlation	−0.209	−0.100	−0.904 **	0.205	0.800 **	1	0.058
	Sig. (2-tailed)	0.130	0.474	0.000	0.138	0.000		0.675
	N	54	54	54	54	54	54	54
Terms seen	Pearson Correlation	0.059	0.017	−0.097	0.160	0.198	0.058	1
	Sig. (2-tailed)	0.670	0.904	0.484	0.247	0.150	0.675	
	N	54	54	54	54	54	54	54

* Correlation is significant at the 0.05 level (two-tailed). ** Correlation is significant at the 0.01 level (two-tailed).

4. Results

4.1. Incidental vs. Intentional Vocabulary Learning

In order to explore whether incidental vocabulary learning is more effective than intentional vocabulary learning in digital game-based scenarios, an independent samples *t*-test was performed, as Table 2 shows. Students using the target items performed better in the post-test ($M = 5.19$, $SD = 1.145$) than those merely encountering them ($M = 2.44$, $SD = 1.340$), $t(52) = 8.081$, $p \leq 0.001$, 95% CI (2.060, 3.421). Furthermore, the effect size ($d = 2.199$) suggests that intentional vocabulary learning is strongly more effective than incidental vocabulary learning in the game *Among Us*.

Table 2. Independent samples test. Incidental vs. intentional vocabulary learning.

		Levene's Test for Equality of Variances		*t*-Test for Equality of Means						
									95% CI of the Diff.	
		F	Sig.	t	df	Sig. (2-Tailed)	Mean Diff.	Std. Error Diff.	Lower	Upper
Terms learnt	Equal variances assumed	1.972	0.166	8.081	52	0.000	2.741	0.339	2.060	3.421
	Equal variances not assumed			8.081	50.765	0.000	2.741	0.339	2.060	3.422

4.2. Effect of Repetition of Target Items on Incidental Vocabulary Learning

To analyze whether repetition could account for any learning gains in L2 vocabulary (i.e., whether the number of times students from the incidental condition came across a target item could predict any vocabulary gains in the post-test), a linear regression was performed including the results of the post-test for the incidental condition (*M* = 2.44, *SD* = 1.340) as the dependent variable. Overall, this model explained 60.5% of the variance ($F_{[2,24]}$ = 18.353, *p* = 0.000), in which both the factors 'times a target item is seen' (β = 0.269) and 'proficiency in English' (β = 0.683) seemed to have a positive influence on the learning of L2 vocabulary, as determined by the post-test, as Table 3 shows.

Table 3. Effect of repetition of target items on incidental vocabulary learning. Model coefficients [a,b].

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	−6.151	2.614		−2.353	0.027
	English proficiency	0.354	0.068	0.683	5.238	0.000
	Terms seen	0.109	0.053	0.269	2.061	0.050

[a] Dependent variable: terms learnt; [b] Selecting only cases for which method = incidental; Note: *n* = 27; R^2 = 0.605; adjusted R^2 = 0.572; $F(2,24)$ = 18.353, *p* = 0.000.

4.3. Effect of Use of Target Items on Intentional Vocabulary Learning

To ascertain whether intentional production could account for any learning gains in L2 vocabulary (i.e., whether the number of times students from the intentional condition used a target item could predict any vocabulary gains in the post-test), a linear regression was performed including the results of the post-test for the intentional condition (*M* = 5.19, *SD* = 1.145) as the dependent variable. The regression model explained 52.1% of the variance ($F_{[3,23]}$ = 8.333, *p* = 0.001) and showed that whereas the factor 'times a target item is used' (β = 0.487) was a predictor of learning success, the factors 'times a target item is seen' (β = −0.038) and 'proficiency in English' (β = 0.310) seemed to have no statistical effect on the learning gains measured at the post-test, as Table 4 shows.

Table 4. Effect of use of target items on intentional vocabulary learning. Model coefficients [a,b].

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.596	2.658		0.977	0.339
	English proficiency	0.179	0.109	0.310	1.642	0.114
	Terms seen	−0.013	0.052	−0.038	−0.253	0.802
	Terms used	0.146	0.057	0.487	2.586	0.017

[a] Dependent variable: terms learnt; [b] Selecting only cases for which method = intentional; Note: *n* = 27; R^2 = 0.521; adjusted R^2 = 0.458; $F(3,23)$ = 8.333, *p* = 0.001.

4.4. Effect of English Proficiency and Repetition on the Use of Target Items

Finally, to explore the effect of English proficiency and repetition on the use of target items (i.e., whether students' proficiency in English and/or encountering the target items while playing could stimulate their use within the intentional condition), a linear regression analysis was carried out including the number of times the target items were used (*M* = 11.15, *SD* = 3.810) as the dependent variable. Overall, the regression model explained 41.2% of the variance ($F_{[2,24]}$ = 8.394, *p* = 0.002), although the factor 'times a target item

is seen' (β = −0.182) seemed to have no statistical effect on the use of target items within the intentional condition, as shown in Table 5. On the contrary, the factor 'proficiency in English' (β = 0.639) appeared to be a predictor of the number of times students from the intentional condition used the target items while playing.

Table 5. Effect of English proficiency and repetition on the use of target items. Model coefficients [a,b].

	Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
	(Constant)	10.673	9.345		1.142	0.265
1	English proficiency	1.231	0.304	0.639	4.049	0.000
	Terms seen	−0.212	0.184	−0.182	−1.153	0.260

[a]. Dependent variable: terms used; [b]. Selecting only cases for which method = intentional; Note: $n = 27$; $R^2 = 0.412$; adjusted $R^2 = 0.363$; $F(2,24) = 8.394$, $p = 0.002$.

5. Discussion

This study analyzed L2 vocabulary learning gains of students playing the online multiplayer social deduction game *Among Us* and compared the effectiveness of the incidental and intentional vocabulary learning strategies brought into play. It also analyzed whether gender and proficiency in English, along with other variables, could predict the learning of target items in the game.

The first hypothesis, which anticipated that players using new L2 words in the online multiplayer social deduction game *Among Us* would retain more vocabulary than players only encountering them, was supported by the results of the study. In fact, out of eight target items, students from the intentional condition ($M = 5.19$, $SD = 1.145$) learnt twice as many as students from the incidental condition ($M = 2.44$, $SD = 1.340$), as determined by the post-test, thus supporting studies that suggest intentional strategies are more effective than incidental approaches to vocabulary learning in formal education [10,51]. This is also in line with the notion that 'the retention of word meanings in a true incidental learning task is very low indeed' [60], or, as Sonbul and Schmitt [61] posit, 'an uninstructed, incidental, approach to L2 vocabulary acquisition does result in lexical gains, but they are modest'. This may lead to the conclusion that encountering new words, if not in combination with vocabulary-related tasks, does not foster their retention [52] and that direct instruction may be needed to add value to the learning process and to lead to greater gains in vocabulary [61]. It should also be noted that, as Schmitt [10] suggests, the effectiveness of incidental and intentional learning may vary according to different stages in L2 learning. Whereas intentional learning may help focus directly on form-meaning links at the early steps of new vocabulary building, incidental learning may provide advanced learners with affordances for enhancing contextual learning, thus proving more effective at higher stages of vocabulary acquisition. Participants in this study held an elementary level of English, as determined by testing, which may explain the moderate effect on vocabulary learning of merely encountering the target items while playing.

The second hypothesis, which anticipated that the more times a word is encountered by a student in the online multiplayer social deduction game *Among Us*, the more likely it is to be learnt, drew mixed results. The regression model for the incidental condition showed that the factor 'times a target item is seen' was a predictor of vocabulary learning gains in the post-test, which supports claims that contextualized, incidental exposure to new words leads to vocabulary learning [62,63] that 'repetitive exposure [. . .] to words also has a positive influence on incremental vocabulary acquisition in gaming' [31]. As Kitajima [64] indicates, encountering unknown words in meaningful contexts, and recognizing the relationships between such unknown words and such contexts, supply information that may assist in the learning of those words. Thus, it can be stated that vocabulary input provided by students intentionally helped other users trigger incidental vocabulary learning gains in the game *Among Us*. However, the regression model for the intentional condition suggested that encountering a target item (i.e., when other participants from the intentional condition used a target item) was not a predictor of vocabulary learning. This challenges the notion

that even in an intentional approach, 'some incidental L2 vocabulary learning is going to take place' [22], and that a combination of both incidental and intentional approaches is desirable to achieve greater learning gains [11,65], although it may be a consequence of players' cognitive resources being drained by multitasking, i.e., following the discussions and creating relevant phrases including the target items, as supported by the Cognitive Load Theory [66].

The third hypothesis, which suggested that the more times a word is intentionally used by a student in the online multiplayer social deduction game *Among Us*, the more likely it is to be learnt, was also supported by the results of the study. Specifically, the regression model showed a large effect of using the target items while playing on the post-test results, which is in line with Kitajima [64], who suggests that encouraging students to use target words (output-focused activities) leads to greater retention rates than merely having them respond to comprehension questions involving target words (input-focused activities). This result seems to confirm York's [49] belief that *Among Us* can be effectively used to strengthen vocabulary knowledge as players have to create formulaic expressions through collaborative dialogues over repeated game sessions. In fact, the repetition of the target words might have been reinforced by the sense or desire of winning among players, as highlighted in previous research [67]. This is so because games often encourage learners to further understand the words by giving different situations using the same words [68], and they can provide learners with enough repetition and frequencies of occurrences of the target vocabulary [43]. Furthermore, this finding contributes to the need for further research in the learning of the productive word knowledge through playing digital games [12].

The fourth hypothesis, which suggested that factors such as gender and L2 proficiency are predictors of digital game-based vocabulary learning, was also partially supported. Regarding gender, unlike in other studies [54,69–73], the results yielded no statistically significant differences between males and females concerning scores in the post-test—as a matter of fact, the data showed no correlation whatsoever between gender and any relevant variable (i.e., number of target items learnt, frequency of use of target items in the game, proficiency in English), which is in line with previous research [74]. Conversely, the factor 'proficiency in English' seemed to have an effect on several of the variables measured. Students from the intentional condition having a greater knowledge in English used more target items while playing than those with lower proficiency levels. Similarly, this factor was also a predictor of learning gains—the higher the knowledge in English, the larger the amount of target items learnt, as determined by the post-test. In general, it is believed that a higher knowledge in English would have resulted in greater vocabulary gains, since, as Elgort [75] states, 'vocabulary development progresses differently for low-and high-proficiency learners, even when level-appropriate L2 input is used', especially considering the moderately positive correlation between the variables 'proficiency in English' and 'target items learnt' ($r = 0.489$). This is also in line with previous research carried out by the researchers [76–79], which suggests that participants with high proficiency in English may benefit more from the learning affordances provided by digital-game based scenarios.

However, several limitations must be taken into consideration when interpreting these results. First, it is assumed that participants were paying attention to the written interactions that took place during discussions within the game. In other words, it is assumed that participants viewed the target items as they appeared in the debates concerning who the impostors were. However, it might have been the case that some target items were overlooked due to different reasons—on the one hand, students from the intentional condition were encouraged to use the target items, which might have resulted in excessive cognitive load allocated to finding the right moment to use phrases including them than to following the discussion and to processing the target items used by other participants. As already suggested, this may explain why the factor 'times a target item was seen' was not a predictor of learning success for the intentional condition. It also aligns with claims that contextual information does not necessarily lead to vocabulary building—Paribakht and Wesche [80] state that learners tend to ignore unknown words

unless they hinder comprehension, whereas Kitajima [64] posits that 'even helpful contexts or redundant information that enables learners to infer the meanings of unknown words may not force them to allocate attention to those words'. On the other hand, the game dynamics involve some players (impostors) killing others (crewmates). Once a crewmate is killed or an impostor is ejected, they no longer participate actively in the discussion as to who the impostor (or impostors) might be, which may prevent them from paying full attention to their peers' utterances and therefore from processing some phrases containing the target items. Second, following completion of the pre-test, students from the intentional condition were given a sheet of paper containing the target items along with a sentence likely to be used in the game *Among Us*, which they took home and were encouraged to revise. Considering the high success rate at the post-test (5.19 average right answers for the eight target items), it is believed that this might have had an impact on the learning outcomes. All in all, it seems that going over the terms and being able to use them in the game combined proved to be an optimal strategy to learn new vocabulary, although future research should look into the effect of these two factors separately. Third, the test on the different target items focused on the productive level by checking whether participants were able to provide a meaningful sentence that would illustrate their meaning in context. Sentences were graded as incorrect when they did not make the meaning of a target item clear. Thus, some answers might have been considered to be wrong simply because a student did not come up with a relevant context, because the meaning of the target item it contained could not be clearly inferred, or because they lacked the vocabulary to write a coherent sentence using that word, which must not necessarily be construed as participants being completely ignorant of the meaning of a target item. All in all, this type of test was deemed to be more affordable for the participants than others involving translation or word formation. Conversely, testing their vocabulary at the receptive level by means of activities such as matching, gap filling, or multiple-choice questions might have resulted in random answers and artificial test scores. Finally, although the game is typically played on handheld devices, the participants used desktop computers running an Android operating system emulator. This was done in order to have students use keyboards for text input, which led to swifter and more abundant written interactions. Consequently, this increased the frequency and repetitions of the target items, which, along with students being encouraged to use them, may have influenced how this practice with the game *Among Us* affords vocabulary learning if compared to a regular, non-controlled gaming experience.

6. Concluding Remarks

Taken together, the results of this study suggest that using new words in the game *Among Us* is more effective than merely encountering and eventually interacting with them, which may lead to the conclusion that an intentional approach is more effective than an incidental one concerning digital game-based vocabulary learning. Since the use of new vocabulary in the game was encouraged by the researchers at the beginning of the experiment, these results align with claims that a certain degree of instructional support is needed in the use of video games in order to achieve the desired learning outcome [81–83]. The results also seem to indicate that repetition and use are important factors in the learning that goes on in digital game-based scenarios, which supports previous studies by the researchers [35]. Thus, it is suggested that educators provide learners with settings that promote gameful engagement with new vocabulary and which, as Hulstijn et al. [84] suggest, make students notice its form-meaning relationships. In addition, the learning outcomes were positively affected by the participants' proficiency in English, which indicates that advanced learners may benefit more from online multiplayer games in general and from the game *Among Us* in particular with regard to the learning of new vocabulary in foreign languages. On the contrary, gender was not a predictor of vocabulary learning gains, which suggests that *Among Us* is—independently of any differences in satisfaction, which were not computed for this study—a suitable game for the acquisition of new words among both female and male language learners.

Appendix A

Table A1. Target items and contexts provided.

Term/Phrase	Sentence
chase	Green was chasing me/I was chasing red.
deplete	He was chasing me when oxygen depleted.
engine	I was fueling the engine/I saw him fueling the engine.
fix	I was fixing the lights.
follow	Green was following me/I was following red.
fuel	I was fueling the engine/I saw him fueling the engine.
ladder	I used the ladder to quickly get away from the impostor.
lie	You are telling lies!/That is a lie!
perform	He was not performing any tasks/What task was he performing when you saw him?
positive	I'm positive that you are lying/I'm positive that is what happened.
proof	Have you got any proof?/Proof?
reckon	I reckon that you are lying.
refrain	Please refrain from pressing the button!/Please refrain from talking nonsense!
skip	I'll skip voting.
storage	The body was in storage/I was in storage.
suspicious	Red looks suspicious, he's acting strangely.
task	We must finish the tasks/How many tasks are left?
vent	I saw him inside the vent/He went down the vent.
wires	I was fixing the wires.
witness	I witnessed red killing blue/I didn't witness anything.

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