

The Comparative Effects of Technology-Mediated TBLT, Problem-Based Instruction Online, Online Flipped Learning, and Lecture-Based Online Teaching on EFL Learners' Online Language Learning Self-Regulation

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Abstract

Learners' self-regulation is of paramount importance in online language learning. Thus, the present study was conducted to compare three online instructional methods of Technology-Mediated Task-Based Language Teaching (TM-TBLT), Problem-Based Instruction Online (PBIO), and Online Flipped Learning (OFL) with each other and with lecture-based online teaching in terms of their effect on language learners' self-regulation. To this end, 120 intermediate-level English learners were selected through convenience sampling, screened through the Oxford Quick Placement Test (OQPT), and assigned (randomly) to one control and three experimental groups. They received instruction according to the principles of TM-TBLT, PBIO, OFL and a conventional lecture-based method, respectively. The data were collected using an online self-regulated English learning (OSEL) questionnaire and analyzed using Analysis of Covariance (ANCOVA). The findings revealed that all three experimental treatments had significant effects on online language learning self-regulation. The comparisons showed that all three instructional methods were equally effective in improving the participants' online self-regulation. The findings will have practical implications for teachers to choose the best-fitting online instructional methods for improving learners' self-regulation in online contexts. These findings can also help syllabus designers and material developers to write syllabi or create materials with special attention to fostering language learners' self-regulation.

Keywords: online flipped learning, online language learning self-regulation, problem-based instruction online, technology-mediated task-based language teaching

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1. Introduction

Advanced technology, media, international interactions as well as academic and professional goals of the population around the world in the 21st century have maximized the need for language education across the globe. On the other hand, language education has been integrated with information and communication technology for decades, and thus, online language classes have been widespread. These days, it is becoming the preferred mode of teaching and learning for many institutes and learners due to the many benefits that it offers, including flexible class schedule, cost-effectiveness and accessibility. Therefore, the present study aims to make a comparison among three state-of-the-art online instructional methods; namely, technology-mediated task-based language teaching, which makes use of principles of task-based language teaching in the technological environment and using technological tools; problem-based instruction online, which is based on learning a subject-matter through solving problems in an online environment; and online flipped learning, which is based on the substitution of the class-home activities in an online environment.

Online learning offers an environment in which students have more space to be their real selves. They have more freedom in terms of class rules, exam conditions and homework obligations. In this regard, Fagan (2006) stated that the great variety of digital tools and devices at learners' disposal has led to a restructuring of the framework of traditional language classes and rendering a more flexible technology-mediated learning and teaching context. Additionally, Sun (2021) mentions that the intervention of technology has reformed the educational context into a more learner-centered context. In this context, learners are responsible for their own learning. They deal with technological devices, survive in the new and strange environment of a language class, and communicate with classmates and teachers in a virtual environment; they are expected to act more independently than before. Thus, students who learn a language in an online environment need to be more self-regulated to survive in such a learner-centered environment. Self-regulation is a significant factor in effective technology-mediated and online language teaching (An et al., 2021, Khodaei et al., 2022, Yu, 2023).

Nevertheless to say, students rarely know how to set goals, maintain enough motivation, find the best way of learning, and generally get control of their own learning unless they are guided by their teachers. They need to be told by the teacher about what to do and how to go about learning. This is the realization of learners' lack of self-regulation. This problem is doubled when students enter an online environment, and they are far away from the teacher, who used to control every action and check every progress in face-to-face classes. As previous research has shown, learners may lack autonomy in an online environment and their self-regulation may be influenced by this environment (Helm, 2015). Fortunately, although self-regulation is a factor related to learners' personalities, teachers and the instructional approaches they adopt can be very effective in instilling these characteristics in learners (Huang, 2022). Thus, it is necessary for an online environment that

students be taught through instructional methods that instill self-regulatory skills in them and make them take control of their own learning. Considering the accelerating speed of using online education around the world (Yu, 2023), it is urgent to figure out what instructional methods can improve self-regulation in students.

In this regard, the three methods of TBLT, PBI, and FL have been theoretically claimed to be effective in fostering learners' self-regulation in face-to-face learning (Hadi & Izzah, 2021; Shen & Xu, 2015; Wardani, 2010). However, studies that have tried to check this claim in online language learning are scarce. For instance, Ghahfarokhi and Tavakoli (2020) studied autonomy, a related concept to self-regulation, in a face-to-face class, assisted by TM-TBLT; Wong and Kan (2022) and Yaniawati et al. (2019) investigated self-regulation under the effect of the PBIO method in nursing and mathematics classes, respectively; moreover, Ergulec et al. (2022) and Khodaei et al. (2022) studied self-regulation of pre-service teachers and nursing students in OFL classes, respectively. Although, all of these studies have resulted in the beneficial effects of TM-TBLT, PBIO, and OFL on students' self-regulation, none of them were dedicated specifically to English learners' online self-regulation under the influence of completely online instructions using TM-TBLT, PBIO, and OFL methods. In addition, none of these studies were comparative in nature to show the differences among the above-mentioned instructional methods in terms of their effect on language learners' self-regulation.

Therefore, taking into account the importance of self-regulation in online language learning and the necessity of adopting a suitable instructional method for fostering this factor in students, the present study intends to analyze and compare the effects of a conventional method and three online instructional methods of technology-mediated task-based language teaching (TM-TBLT), problem-based instruction online (PBIO) and online flipped learning (OFL) on students' online language learning self-regulation. It addresses the following question:

Are there any statistically significant differences among TM-TBLT, PBIO, OFL, and conventional online instruction in terms of their effectiveness on learners' online self-regulation?

2. Literature Review

2.1. *Self-Regulation*

The process of learning a new language requires learners to determine their goals, find the best way of learning, and get control over the process of learning (Choi et al., 2018). These capabilities all lie in one's self-regulated learning skills. According to Dörnyei (2005), self-regulation is a multi-faceted concept of cognitively, meta-cognitively, motivationally, behaviorally, and environmentally processing one's academic performance, which helps him/her achieve a better outcome. Online learning self-regulation, on the other hand, may have some differences from self-regulation in conventional environments of learning (Barnard et al., 2009). It comprises learners'

ability of setting a goal, managing time, structuring of the environment they are learning in, seeking help, task strategies, and evaluating oneself (Barnard et al., 2009).

Many factors have been mentioned in the literature as having a positive effect on learners' self-regulation. The first of these factors is engagement. Deep engagement makes learners go beyond what they have been assigned to do and raises their risk-taking and psychological investment into mastering the knowledge or skill (Paris & Paris, 2001). The next factor is open-ended environments; according to Paris and Turner (1994), learners tend to show more volitional control, use more strategies, and tolerate more difficulties in open-ended environments. The next factor is motivation (Giesbers et al., 2013). Extrinsic motivation stems from learners' attitudes toward ease of use and usefulness of the online system, and intrinsic motivation originates from learners' enjoyment of technology (Din Shah, 2013; Mitchell et al., 2012). The last factor is course quality, which depends on the design, content, output appropriateness, and ease of understanding (Albelbisi & Yusop, 2019; Hassanzadeh et al., 2012; Owens & Price, 2010; Sun et al., 2008). These factors may, in turn, be affected by other factors like teaching methodology. The purpose of this study was to see how TM-TBLT, PBIO and OFL can affect language learners' online self-regulation in comparison to each other and conventional online instruction.

2.2. Technology-Mediated Task-Based Language Teaching (TM-TBLT)

Task-Based Language Teaching (TBLT) refers to “an approach based on the use of tasks as the core unit of planning instruction in language teaching” (Richards & Rodgers, 2014, p.223). The theoretical underpinning of TBLT is founded on the CLT method and the philosophy of experiential learning or learning by doing. One of the research lines in the domain of TBLT is the integration of TBLT and CALL, which is of great importance, especially during the years when almost all language classes had to be held online, due to the COVID-19 lockdown. CALL has its roots in the interactionist perspective (Chapelle, 2001), sociocultural theory, and socio-constructivism (Hubbard, 2009; Lantolf & Thorne, 2006; Levy & Stockwell, 2013). According to these perspectives, language learning is mediated by the socio-cultural context in which the learner interacts with others, and it is through these interactions that meaning is co-constructed by the mutual effort of learners and teachers. The integration of CALL with TBLT started from the idea that using technology in TBLT classes can transcend the quality of TBLT classes in terms of learning opportunities, the number of channels and resources for performing tasks, and the possibility of freer tasks (Lai & Li, 2011; Sykes et al., 2008). A technology-mediated task is a holistic activity that leads learners to a situation in which they are supposed to stretch their linguistic, cultural, cross-cultural, internet-based interaction skills, and technological knowledge in order to accomplish a non-linguistic goal (Lai & Li, 2011). Smith and González-Lloret (2021) hold that this line of research has many venues of investigation that are waiting to be explored. Previous research in the domain of TBLT has shown that if teachers provide appropriate modeling and scaffold learners

well, and if the activities are carefully designed, TBLT will promote self-regulation (Paris & Paris 2001; Yen, 2017). Nevertheless, there is a scarcity of suitable studies in the domain of the impact of TM-TBLT on learner self-regulation. However, learner autonomy, which, according to Benson (2011), is a related subject to self-regulation, was investigated in a TM-TBLT environment by Ghahfarokhi and Tavakoli (2020). In a quantitative study with Iranian intermediate EFL learners, they examined the impact of technology-mediated reading tasks on learner autonomy. To this end, they integrated some applications like *Barefoot World Atlas app* and *PicCOLLAGE app* into a face-to-face reading class and compared it to a traditional reading class. Their result suggested that learner autonomy and metacognitive strategy use improve better using technology-mediated tasks than traditional explicit reading comprehension activities. Since TM-TBLT can positively affect learner autonomy, it probably has a positive effect on learners' self-regulation; however; this is an issue to be resolved through research. In another study, Robillos (2021) studied the effect of computer-assisted argument mapping (CAAM) on 28 freshman students' self-regulation of learning awareness. In this mixed-methods research, they found that CAAM increased students' awareness of their self-regulation in terms of self-monitoring, planning, self-efficacy and effort.

2.3. Problem-Based Instruction Online (PBIO)

Wardani (2010) defined Problem-based instruction (PBI) as a “learning model that presents authentic and meaningful problems so that students can conduct their own investigations and discoveries” (p.27). In a more detailed elaboration, Isrokijah (2020) explains that in PBI, primarily a real-world problem is introduced to students, and they are asked to solve the problem, but they are not left alone in this process. Teachers facilitate this problem-solving process; thus, students will be able to build content knowledge and acquire self-directed learning skills, and skills of higher-order thinking. Problem-based approaches are believed to create in-depth and life-like learning experiences that require language learners to merge their knowledge of different disciplines and build cultural connections (Hearn & Hopper, 2008). The emphasis on the thinking process and self-construction of knowledge stems from cognitive psychology, constructive views of learning, and active learning framework, and it is based on these underpinning theories that learners are asked, after the problem-solving phase, to reflect upon their learning outcomes (Hadi & Izzah, 2021, Hung, 2015). The focus of PBI is on self-directed content knowledge acquisition, critical thinking skills, and problem-solving ability that the students gain in the process of solving life-like problems. Huang and Wang (2012) hold that the final goal of PBI is to create self-directed learners with high intrinsic motivation, ability of critical thinking, and high-level knowledge who are capable of teamwork and collaboration.

PBI can also be used in online education. Savin-Baden (2007) pointed out that among many online education models, PBI online is a type of collaborative model that requires learners to participate in a team-led discourse whose aim is to construct collective capabilities, knowledge and

understanding. Broadly defined, PBI online is a model in which learners work in groups of four to six members on a series of problem scenarios that collectively make up a unit of study. These learners collaboratively work to tackle the problem. The students start their collaboration by finding out what it is that they need to learn to solve the problem introduced to them (Savin-Baden, 2007). Teachers (facilitators) also mediate students' collaboration by monitoring their online discussions; however, what matters is that students are aware of the program objective and have the ability to negotiate their own learning needs.

With respect to self-regulation among students receiving PBI instruction, many studies have been done in a variety of fields. Sungur and Tekkaya (2006) showed that in the field of biology, students' metacognitive self-regulation improved in PBI classes. Leary (2012) conducted a meta-analysis analysis which showed a significant overall medium effect size in favor of PBI compared to traditional instruction across many disciplines like education, medicine, history, business, etc.

In the domain of online problem-based instruction, however, the importance of self-regulation in the language learning framework has not yet received due attention from scholars. In the nursing profession, Wong and Kan (2022) showed that PBIO can be significantly more effective than conventional instruction in increasing students' self-regulation. In the domain of mathematical problem-solving, Yaniawati et al. (2019) conducted a study to analyze the impact of e-learning-assisted PBI on self-regulated learning. They used a mixed-method approach using a test, a questionnaire, an interview, and observation to compare mathematics undergraduate students in terms of their problem-solving ability and self-regulation in two classes of PBIO and conventional mathematics. Their findings indicated that students can benefit more from PBIO classes than conventional classes both in terms of problem-solving skills and self-regulation strategies. However, in spite of the beneficial effect of self-regulation in improving language learning and theoretical emphasis on the potential of PBI in increasing self-regulation in language learners (Huang & Wang, 2012), there is a paucity of research dedicated to the effect of PBIO on language learners' online self-regulation in online language classes.

2.4. Online Flipped Learning (OFL)

Time limitation can bring about many fundamental problems for the CLT teaching method, and that stems from students' few opportunities to receive input, produce output, and interact (Spino & Trego, 2015). The flipped learning model is a good choice for overcoming these problems in that teachers provide pre-class input material for students to watch, listen to or read so that they have more time during the class for producing output and having interaction (Pica et al., 1996). Being theoretically based on *active learning*, FL pushes students into situations in which they do things, and at the same time, they think about what they do. Chen Hsieh et al. (2017) define FL as an approach in which the time sequence of homework and classroom activity has been inverted. In conventional classrooms, students sit quietly in the classroom, listen to the teacher giving lectures,

and then are left alone at home to practice and do homework. In contrast, in FL, students take time at home to watch videos, made by the teacher, to receive the lesson, and then they have the opportunity to use the newly learned knowledge in a more dynamic and interactive environment of the class, where the teacher is present to correct them and answer their questions whenever needed (Chen Hsieh et al., 2017).

A complete and accurate realization of flipped learning happens when teachers base their instruction on the four basic pillars of flipped learning. The F-L-I-P pillars include a flexible environment, learning culture, intentional content and professional facilitator (Alharbi, 2015). The *flexible environment* criterion encompasses flexibility in arranging space, individual or group work, learning timeline, teachers' expectations, and teaching approaches. *Learning culture* refers to the learner-centeredness of this approach in which the learner is responsible for knowledge construction and self-evaluation. The *intentional content* focuses on the fact that the content that the teacher uses is not haphazard; however, the teacher meticulously chooses them and differentiates between the content materials to be taught in the class and the content materials to be learned at home. Finally, the *professional educators* refer to the extremely critical role that the educators of FL play.

The active learning approach, Wang and Wright (2018) argue, can be a great fit for FL classroom approaches. From among the different forms of active learning, the two forms of guided, self-directed learning and cooperative learning can highly raise the effectiveness of FL (Shen & Xu, 2015). Guided, self-directed learning is realised in the out-of-the-class activities of FL in which students use the videos and contents selected and provided by the teacher and get ready for the classroom activity. On the other hand, FL can use a cooperative learning approach in the class to put learners in situations where they use complex cognitive thinking (Shen & Xu, 2015). The cooperative learning approach advocates learners' collective task completion based on the principles of group decision-making, mutual interaction, individual accountability, and positive interdependence (Shaaban & Ghaith, 2005).

Regarding the effect of FL on self-regulation, there are many studies indicating the effect of this method on learners' self-regulation. For instance, Hewitt et al. (2014) conducted a comparative case study on the effect of FL on self-regulation. Their study analyzed how FL supports self-regulation. Their findings showed that flipped learning both requires and improves self-regulated learning. In another study by Fathi et al. (2021), the effect of flipped learning on students' writing performance and writing self-regulation was analyzed. The findings showed that the FL method positively influenced both writing performance and writing self-regulation. Samadi et al. (2024) compared the effect of flipped classroom with traditional instructional modes on students' self-regulated learning strategies. They used 60 language learners and conducted quantitative data analyses and found that flipped classroom can significantly improve language learners' self-regulated learning strategies. The effect of FL on students' self-regulation has also been studied by

other scholars (Izadpanah, 2022; Moradi et al., 2022), and they have all reported that FL can increase self-regulation in language learners.

In an online environment, students' self-regulated learning has been studied by Ergulec et al. (2023), who conducted a study with 396 pre-service teachers in Turkey to find out the relationships between FL, self-regulated online learning, and academic procrastination. They used path analysis techniques and found a positive relationship between OFL and self-regulated online learning. Within the online framework, in the field of nursing, Khodaei et al. (2022) conducted a quantitative study with 34 sophomore Iranian nursing students. They observed that students' self-directed learning readiness increased significantly as a result of OFL instruction. As it is obvious from the reported literature, although studies have been done about the impact of online flipped learning on students' online self-regulation in other fields, there is a scarcity of studies related to the impact of OFL on language learners' online self-regulated learning, which calls for more research in this regard.

In addition to the inattentiveness toward the individual effects of the instructional methods of TM-TBLT, PBIO, and OFL on language learners' self-regulation in the online environment, the comparative effects of these instructional methods have not received enough attention either. As far as comparison is concerned, Hidajat (2023) compared the effects of problem-based conventional learning with creative problem-based learning on self-regulation. Pionera et al. (2020) compared two other instructional methods, namely Cooperative Integrated Learning with Composition and Picture-Word Inductive Model on self-regulation. Hosseini et al. (2020) compared micro-learning content delivery flipped learning with conventional flipped learning. Nonetheless, no adequate research study was dedicated to comparing the effects of TM-TBLT, PBIO, and OFL on language learners' self-regulation.

Having a look at the literature, one can understand the significance of task-based language teaching, problem-based instruction, and flipped learning approaches in transforming classes into a venue for improving learners' self-regulation. However, in spite of the key role that self-regulation can play in online environments, the effect of these instructional methods on learners' online self-regulation has not been given due attention. Therefore, the present research is an attempt to examine and compare the effects of TM-TBLT, PBIO, and OFL on online language learning self-regulation.

3. Methodology

3.1. Participants

This study was conducted with 120 adult intermediate English learners (including both genders with an age range of 19 to 40) who were selected through convenience sampling. They were homogenized using the Oxford Quick Placement Test (OQPT). These students were then assigned

to one control group and three experimental groups, namely TM-TBLT, PBIO, and OFL. There were 30 students in each group.

3.2. Instruments

To achieve the purpose of this study, the researchers utilized OQPT to check the participants' proficiency levels and to homogenize them prior to the treatments. Oxford University Press Web Site (2001) has reported that OQPT is a standard placement test with high validity and reliability (0.9). The online self-regulated English learning (OSEL) questionnaire was also used. This questionnaire was adopted from Zheng et al. (2016). It has been used in previous studies (e.g., Hunutlu, 2023; Wulandari Tasik, 2020; Zheng et al., 2016). Zheng et al., (2016) piloted and validated it and reported a Cronbach's alpha of 0.91 for the questionnaire. The questionnaire contains 21 items, including five sections: goal setting (5 items), environment structuring (4 items), task strategies and time management (5 items), help-seeking (3 items) and self-evaluation (4 items). The participants were supposed to answer the questions on a 5-point Likert scale with values ranging from 1 (do not agree at all) to 5 (strongly agree). Because the questionnaire has been used in various previous studies, and because we did not change its content, its validity was taken for granted. The reliability index of the Persian translated version was estimated using Cronbach's alpha, and the result turned out to be 0.84.

3.3. Materials

The instructional materials of this study included technology-mediated tasks (TM-tasks), problem scenarios, instructional texts, wordlists, class PowerPoint files, pre-class PowerPoint files, worksheets, and video clips. The class PowerPoint files, text files, wordlists, and video clips were used in all three classes. The TM-tasks were used in the TM-TBLT class. The problem scenarios were used in the PBIO class. The pre-class PowerPoints and worksheets were used in the FLO class. The TM-tasks were designed in alignment with Gonzalez-Lloret and Ortega's (2014) characterization of tasks in the context of technology-and-task integration. Thus, in every step of designing these tasks, attempts were made to design them to be a) primarily focused on meaning, b) goal-oriented, c) learner-centered, d) holistic, and e) leading to reflective learning. These tasks included *brainstorming*, *ranking*, *comparing and contrasting*, *fact-finding (homework)*, *sharing the findings*, and *problem-solving*. The problem scenarios consisted of a written real-world question or problem that was presented to the participants, and they were asked to work together collaboratively to generate ideas and make hypotheses to solve the problem. These scenarios were designed based on design features proposed in Hearn and Hopper (2008) and Savin-Baden (2007); therefore, they were complex real-world situations that were related to the course content being taught, loosely structured to allow for several interpretations, and aligned with the

participants' needs and social, political, and economic environment. An example of the scenarios used in this course is as follows:

The education system of Iran is flawed; it has many weaknesses. How can we reform this system? What changes can we make to Iran's education system to make it more effective, based on some inspiration from the education system of Finland?

3.4. Procedure

Before starting the experiment, the OQPT was administered online to homogenize the participants in terms of their language proficiency. Then, the selected students were randomly assigned to three experimental and one control groups. Afterwards, the participants were all invited to Skype groups of their class, and the self-regulation questionnaire was shared with all of them to fill out before the course. All classes had 17 two-hour sessions that were held through the platform of Adobe Connect. The first session was dedicated to familiarizing the participants with the virtual environment and the teaching approach, checking for problems and disconnections, and establishing rapport with the students. The last session was dedicated to filling out the self-regulation questionnaire after the treatment.

The first experimental class was taught through technology-mediated task-based language teaching. Every session in the TM-TBLT class, a video clip was played, or a text file was given to the participants along with the word list of the target vocabulary items. The topics of tasks were chosen as close to the participants' lives as possible. Students were divided into groups of three to four members. The Adobe Connect environment gives the teacher the chance to categorize students into different groups and yet be able to participate in each of these groups to give feedback, help students, and mediate their learning process through the option of *breakout rooms*.

The second experimental group was taught through problem-based instruction online (PBIO). The participants were briefed about the steps of PBIO, including: 1) Read the case 2) Check for understanding 3) Ask questions 4) Look for new information. 5) Discuss 6) Offer solutions 7) Evaluate 8) Reflect and revise solutions (Hearn & Hopper, 2008) in the first session. They worked on five different problem scenarios during 15 sessions and received one problem scenario every three sessions to work on. At the beginning of the first day of each of the three sessions, a video clip was played, or a text file was given to the participants to read. Then, the main problem was shown on the PowerPoint file shared on the Adobe Connect platform. The participants were categorized into groups of three to five members. A discussion chart was provided to each group on the Google Docs page to organize their thoughts and research lines. They used as many resources as they could to gather enough information about the problem and presented their solutions in the form of a PowerPoint file, or a written report on the third session of each lesson. At the end of each collaboration session, the students were asked to think about their own

performances during the group work critically for 5 minutes while filling out a self-evaluation chart on the Google Docs page.

The third experimental group was taught through OFL. The instructional PowerPoint files and the worksheets for each session were provided to them at least three days before the start of each session. The activities were chosen from different active learning activities adapted from previous papers (Bell & Kahrhoff, 2006; Keyser, 2000; Tedesco-Schneck, 2013; Vrasidas, 2000; Walker, 2003), including four-corners, jigsaw, round-robin, debate, number heads together, the fishbowl, think/pair/share or write/pair/share, tea party, team troubleshooting, co-research, and group presentation. In order to engage the participants with higher-order cognitive thinking based on Bloom's (1964) taxonomy, the activities were designed in such a way that they made the students apply the new vocabulary knowledge, analyze and synthesize ideas, and evaluate facts and thoughts, interact with their peers, make decisions, and solve problems.

The control group received regular vocabulary lecture-based teacher-centered instruction. The materials for this class were the same as those of the experimental classes; however, the classes were fully teacher-centered. In order to answer the research question, a one-way ANCOVA was used.

4. Results

To answer the research question, a one-way (ANCOVA) was used. Preliminary assumption-checking was done. Based on these assumptions, the covariate (pretest) was tested before the starting of the intervention and through a reliable scale adopted from Zheng et al. (2016) with the Cronbach's alpha coefficient of 0.91. There was a linear relationship between pretest and posttest for all the four groups. The assumption of homogeneity of regression slopes was also checked through the test of homogeneity of regression slopes, and the interaction between method and pretest was not significant ($F=0.653, p>0.58$). Table 1 shows the result of the descriptive statistics.

Table 1

Descriptive Statistics for Online Self-Regulation

Methods	N	Pretest (covariate)		Posttest			
		Mean	SD	Mean	SD	Adj. Mean	Std. Error
TM-TBLT	30	75.47	7.829	84.27	13.774	84.724	1.885
PBIO	30	78.60	8.398	85.20	12.850	83.333	1.903
OFL	30	76.33	8.903	85.00	12.177	84.815	1.884
Control	30	73.93	9.976	74.33	9.481	75.928	1.898

Table 1 shows that the posttest scores of the experimental groups differ considerably from their pretest scores; however, the mean scores of the different experimental groups are not very different from each other, although they are different from those of the control group. An

ANCOVA was conducted to check if these differences are statistically meaningful. Table 2 contains the result.

Table 2

Test Statistics for the ANCOVA on Online Self-Regulation

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	7447.40 ^a	4	1861.85	17.49	0.00	0.378
Intercept	1018.892	1	1018.89	9.57	0.00	0.077
preT	4957.543	1	4957.54	46.57	0.00	0.288
Method	1591.786	3	530.59	4.98	0.00	0.115

Note. a. R Squared=0.378 (Adjusted R Squared=0.357)

In Table 2, the row related to *method* shows that the variable of instructional method has a statistically significant effect on the participants' online self-regulation, ($F_{(3,115)}=4.98$, $p<0.005$, partial eta squared=0.11). The table also shows that the covariate is statistically significant ($F_{(1,115)}=46.57$, $p<0.005$). To check which of the instructional methods was significantly more effective, pairwise comparisons were made to locate the significant differences. The result is provided in Table 3.

Table 3

Pairwise Comparisons on Self-Regulation

Dependent Variable:posttest						
(I) method	(J) method	Mean Difference (I-J)	Sig. ^b	95% Confidence Interval for Difference ^b		
				Lower Bound	Upper Bound	
TM-TBLT	PBIO	1.391	0.605	-3.928	6.711	
TM-TBLT	OFL	-0.090	0.973	-5.370	5.189	
TM-TBLT	Control	8.796 [*]	0.001	3.509	14.082	
PBIO	OFL	-1.482	0.581	-6.781	3.817	
PBIO	Control	7.405 [*]	0.007	2.033	12.776	
OFL	Control	8.886 [*]	0.001	3.585	14.188	

Note. Based on estimated marginal means. *. The mean difference is significant at the .05 level.

Table 3 shows that all three experimental groups have statistically significant differences with the control group ($p<0.005$). This is an indicator of the significant effect of all three methods of TM-TBLT, PBIO, and OFL in improving the participants' self-regulation in online language learning in comparison to conventional instruction. At the same time, the three experimental groups did not have statistically significant differences from each other. That is, the TM-TBLT ($M=84.72$), the PBIO ($M=83.33$), and the OFL method ($M=84.81$) could equally effectively improve the participants' self-regulation in an online environment.

5. Discussion

One of the findings of this study was that learners' self-regulation can be improved significantly in TM-TBLT classes in comparison to conventional online classes. This finding is in line with Perry et al. (2004) and Paris and Paris' (2001) statements with regard to the positive effects

of TBLT on students' self-regulation. In this respect, Yen (2017) concluded that TBLT can be effective in increasing language learners' self-regulation in a writing class. The present research lends support to Yen's findings in that TBLT can improve language learners' self-regulation. However, the present study examined students' self-regulation in an online vocabulary class and showed that TBLT can also increase students' self-regulation in other modes of teaching such as the online mode.

In the online teaching and learning environment, however, there is a paucity of research studies on the effect of TM-TBLT on self-regulation, although studies can be found on the positive effect of TM-TBLT tasks on learner autonomy (Ghahfarokhi & Tavakoli, 2020), which is, according to Benson (2011), a related concept to learner self-regulation. However, Ghahfarokhi and Tavakoli's study took place in a face-to-face class with the help of TM-TBLT, whereas the present study made use of TM-TBLT in a completely online environment. With regard to the use of TM-tasks in an online environment, the findings of the present study corroborate those of Robillos (2021) in that they both resulted in favorable benefits of TM-task in improving students' self-regulation. However, the present study was conducted with a wider range of students and a wider variety of TM-tasks.

The positive effect of TM-TBLT on the participants' self-regulation can be attributed to different factors. The first of these factors is engagement. According to Paris and Paris (2001), deep engagement takes students beyond their assigned tasks, increases their risk-taking, and motivates them to master knowledge or skill. During the completion of TM-tasks in the present study, the participants seemed deeply engaged as every individual was highly active, and none of them seemed detached from the task at hand. This is in line with Putri (2023), who concluded that TM-TBLT increases students' engagement at behavioral, emotional, social and cognitive levels. The open-ended environment is another factor affecting self-regulation (Paris & Turner, 1994); it was partially present in TM-tasks the participants of this study were engaged with. Although the framework of each TM-task was pre-determined, the participants were not limited to any specific way to complete the tasks, and each group could make their own decision on how to go about the task and what steps to take. The next factor affecting students' self-regulation, specifically in the online environment, is motivation. In the face-to-face environment, TBLT can effectively increase motivation in students (Chua & Lin, 2020), and in the online environment, CALL-mediated TBLT improves students' motivation (Tavakoli et al., 2019) and that could be the reason why the participants of this class were very eager to attend the class and complete each task. These factors all contributed to the participants' high self-regulation in the TM-TBLT class, while the participants in the conventional class could not make use of any of these factors.

It was also observed that, in comparison to conventional online teaching, PBIO could improve the participants' online self-regulation significantly. This finding is in line with previous studies about self-regulation in other fields of study. For instance, Sungur and Tekkaya (2006) found that PBI can increase students' self-regulation in a biology course. In addition, in a meta-

analysis, Leary (2012) found a significant overall medium effect size for the effect of PBI on self-regulation in different fields such as education, medicine, history, business, etc. In this regard, consistent with previous studies, this study confirms that PBI can have a positive effect on students' self-regulation in the field of language education and in the online environment of teaching.

As for students' self-regulation in an online environment, there have been some studies; however, they were conducted in other majors than language education. Wong and Kan (2022) examined self-regulation in nursing students during an online course, and Yaniawati et al. (2019) investigated students' self-regulation in a mathematics class. Both of these studies resulted in favor of PBI for increasing self-regulation in students. In this regard, the present study corroborates the findings of the previous studies and adds that PBI can also be used in language education and increase students' online language learning self-regulation as well.

The participants' high self-regulation as a result of attending the PBI class can be attributed to the nature of PBI, which has a heavy emphasis on students' self-directed, in this case self-regulated, learning. As it was pointed out by Wardani (2010), it is in the nature of the PBI model to introduce a real-life problem to students and have them conduct their own investigation and discoveries. The non-routine and non-structured problems that are presented to the students make them do research and collect information about the topic and then independently create new knowledge (Raaijmakers et al., 2018). It is the creative learning and higher-order thinking in PBI that bring about a high level of orientation and, consequently, increase self-regulation in students (Morris & Rohs, 2021). Thus, in solving a problem, students get to be self-regulated gradually as they work in teams, analyze their own needs and goals and collectively take steps that they see fit for solving the problem or achieving the goal. It seems that in a language class, students' analysis of their needs is not limited to their needs to only solve the problem at hand, but they try to prepare the tool for themselves to talk about the problem and that tool is language. They see their own language deficiencies as gaps that need to be filled in order to be able to speak about the problem, search key words, read texts and understand videos or other students as they talk about the problem. All of these needs require students to become self-regulated in language learning since they look for their language gaps in that topic and look for ways to fill these gaps by studying target vocabulary and taking control of their knowledge on the topic. All of these may have led to the participants' higher self-regulation in comparison to the participants who attended a teacher-centered class.

The findings of this study also showed that the OFL method can significantly improve language learners' self-regulation in comparison to a conventional online method. In this regard, Hewitt et al. (2014) made a comparison between OFL and FL in face-to-face classes and found that FL and OFL both require and cultivate self-regulation. Therefore, the findings of this study agree with Hewitt et al. (2014) in terms of the positive effect of OFL on students' self-regulation. However, this study was an attempt to compare OFL with conventional online teaching and, in so

doing, showed that using OFL instead of conventional teaching in an online environment can raise students' self-regulation.

In another study, Fathi et al. (2021) concluded that FL can raise students' writing self-regulation. In addition, other studies such as Izadpanah (2022), Moradi et al. (2022) and Samadi et al. (2024) resulted in favor of the FL method for increasing self-regulation. This study corroborates the above-mentioned studies about the effect of FL on self-regulation and adds that FL can also be used for increasing students' online language learning self-regulation.

In the domain of OFL in the online environment, some studies have been conducted; and they are all in other fields of study. For instance, Ergulec et al. (2022) examined self-regulation of pre-service teachers and Khodaei et al. (2022) examined nursing students' self-directed learning in an online course; they both concluded that OFL can have beneficial effects on students' self-regulation. This study confirms the mentioned research studies and expands the results regarding the beneficial effects of OFL on students' online self-regulation in the field of language education.

The participants' high self-regulation resulting from attending the OFL class can be explained by different factors that contribute to self-regulation and are triggered by OFL. One of the factors that improves self-regulation is the open-ended environment (Bennett, 2018, Paris & Turner, 1994). The more freedom students have while studying or doing activities in class, the more volitional control they show. One of the main features of FL is its flexibility. This flexibility gives students an open-ended environment to work in. The homework assigned to the students of the FL class gives them high responsibility for completing it; it includes goal-setting, strategy use, and self-monitoring (DiBenedetto & Bembenuddy, 2013; Hewitt et al., 2014). Students in the OFL class deal with open-ended tasks, which according to Bennette (2018), make students do the interpretation of the requirements of an open-ended environment and regulate their own learning on their own.

Accordingly, the participants in this research had freedom in selecting the material that the teacher sent, how to read or watch them, how many times and when to read or watch those materials, how and when to work on the worksheets, and how to prepare themselves for the activities of the following sessions. Deciding about each of these activities required them to set goals, use learning strategies, and self-monitor themselves; this seems to have led to participants' self-regulation. They were always in the process of self-assessment to see if they correctly understood the content of the text or videos, or if they needed more practice to get ready for the next session. Even the worksheets that they filled out before each class could be used as a tool at their hand to assess themselves with regard to their comprehension of the target words of the day. According to Hewitt et al. (2014), all of these lead to students shaping metacognition, which is the main element of self-regulation. This is also in line with Strayer's (2012) statement that students become more self-aware of their learning process in an FL class and self-awareness results in self-regulation.

Another factor leading to a higher level of self-regulation in the OFL class may be students' motivation. According to Giesbers et al. (2013) and Tareen et al., (2023), extrinsic and intrinsic

motivation increases online self-regulation. On the other hand, FL leads to more motivation in students (Kavyani et al., 2015), which consequently results in more self-regulated students. Although the motivation of the participants of this class was not scientifically measured, based on the feedback they gave to the teacher, it seemed that they were very motivated, and their motivation increased over the course of time.

With regard to the differences between the different instructional methods in terms of their effects on learners' self-regulation, some studies have been dedicated to comparisons between conventional problem-based learning and creative problem-based learning (Hidajat, 2023), Cooperative Integrated Learning and Composition and Picture-Word Inductive Model (Pionera et al., 2020), and micro-learning content delivery flipped learning and conventional flipped learning (Hosseini et al., 2020). In this regard, the present study expands our knowledge about the comparative effects of the different instructional methods on students' self-regulation in an online environment.

The findings of this research regarding the comparison of the three instructional methods showed no considerable differences in the self-regulation scores of the three groups. Thus, all three methods improved the participants' self-regulation equally and in their own specific ways. With all the emphasis of the literature on the potential of PBI to increase learners' self-regulation (Marx et al., 1997; Morris & Rohs, 2021; Raaijmakers et al., 2018; Wardani (2010); Wijnia et al., 2011; Wong & Kan, 2022), the findings of this study seem to suggest that the TM-TBLT and OFL methods can also be as effective as the PBIO method in increasing online self-regulation. Since the self-regulation of learners was equal across these classes, and since the factors affecting self-regulation (including engagement, motivation, attitude, and course quality) can be affected by the type of instructional method, it seems that these factors were almost equal in the three experimental methods in this study. According to some scholars (Albelbisi & Yusop, 2019; Hassanzadeh et al., 2012; Owens & Price, 2010; Sun et al., 2008), course quality is an effective factor in changing students' self-regulation. Thus, the equality of self-regulation across these three methods may indicate that they are equally effective in terms of their design, content, output appropriateness, and course material ease of understanding. Other factors affecting self-regulation are engagement (Paris & Paris, 2001), motivation (Deci et al., 1991; Giesbers et al. 2013), including intrinsic and extrinsic motivation (Din Shah, 2013; Mitchell, 2012), and attitude (Kramarski & Gutman, 2006; Presley & Presley, 2009). Based on these studies, it can be concluded that TM-TBLT, PBIO, and OFL probably create equal amounts of engagement, motivation and positive attitude in learners; however, this is a point to be researched in future research studies. Although with regard to the factor of an open-ended environment, which has been shown to be effective in language learners' self-regulation (Paris & Turner, 1994; Turner, 1995), it seems that this factor may be less effective than other factors since, although the experimental groups in this research relatively differed in terms of open-endedness of the environment (PBIO vs. TM-TBLT and OFL), their self-regulation mean scores were almost equal.

6. Conclusion

In light of the results of this study, several conclusions can be drawn. The findings suggest that the teachers can use one of the methods of TM-TBLT, PBIO, or OFL in online teaching to help learners become more self-regulated, take the lead in their own learning, and little by little learn how to learn. This is a very important factor in language learning specifically in online language learning since many language learners do not know how to learn a language effectively; although they study hard, they still have problems using a new language. Moreover, with the addition of the online mode of learning, this problem is doubled since many students feel demotivated or detached from the class and do not get engaged enough in the classroom tasks due to geographical distance. They also feel more confused and disoriented because they are left alone without the moment-by-moment surveillance of the teacher, who used to be there for them at any time in face-to-face classes.

From the finding that all three instructional methods of TM-TBLT, PBIO, and OFL can have equally positive effects on language learners' self-regulation, it can be concluded that in classes where the teacher is dealing with students who need to become more self-regulated in the task of language learning, any of these three methods can be used depending on the teacher and student's preferences. Students' preferences must be evaluated beforehand through surveys or interviews asking direct questions about their preferences, their technological proficiencies, their technological availability, learning styles, self-regulation levels, and the plans that the teacher has in mind about how to conduct each of these methods. It is better that these questionnaires get filled out by students once again in the middle or at the end of the course when they are more familiar with the activities that usually take place in each instructional method.

After evaluating students' preferences, teachers must consider the limitations and challenges of each of these methods when choosing among them. For example, one must take into account that designing TM-tasks for a TM-TBLT class is a very time-consuming activity, whether inside or outside the class. Thus, for a teacher who confronts time limitations, an OFL method can be a better choice since a part of the job is done outside the class. In addition, if the teacher has adult students who are occupied with their own jobs and do not have enough time at home to do research about a problem and find solutions, he/she should opt for TM-TBLT or OFL, which can create much more fun and amusement in class. Furthermore, for assessing students in each of these classes, teachers must choose among assessment methods that fit their teaching methods.

Additionally, since all three methods were equally effective on self-regulation, a combination of these methods or periodic use of these methods during consecutive semesters can be useful for teachers whose students have different learning styles and preferences. For instance, a combination of the OFL method with one of the methods of TM-TBLT or PBIO seems to be effective for improving learners' self-regulation.

However, there are always limitations and challenges with innovative methods. The first one is making the community of users change their previous traditional methods and convincing them about the benefits of the new methods. To solve this problem, supervisors and institutes can encourage teachers and motivate them to get out of their comfort zone and experience new methods. They can also hold monthly forums or workshops to inform teachers about new methods and create interaction among teachers for an exchange of ideas. Another limitation of these instructional methods can be the infrastructure problems that each institute can confront. To solve this problem, the present study suggests the use of simple and common platforms such as Adobe Connect and Google Docs, which are available and affordable for most learners and teachers.

The findings of this study can be beneficial for language learners, language teachers, material developers, and syllabus designers. This study recommends that learners accept the new online context of learning and consider this environment as a chance to become more self-regulated learners than before. Those students who do not know how to manage their own learning can gradually overcome their problems if exposed to instructional methods like TM-TBLT, PBIO, or OFL adopted by an informed and knowledgeable teacher.

Relying on the findings of this study, teachers can choose one of the instructional methods of TM-TBLT, PBIO, or OFL to satisfy the specific needs of some students. For example, depending on the students' level of self-regulation, their technological preferences, and their learning preferences, teachers can choose one of the instructional methods recommended in this study.

Meanwhile, the findings can be appealing to material developers and syllabus designers in the sense that these findings make them aware of the importance of self-regulation in language learners during online language learning and encourage them to design materials and write syllabi specific to online classes according to the principles of TM-TBLT, PBIO, or OFL in order to help students become more self-regulated in online language learning. In this regard, depending on the decisions of the material developers, one or all of these materials can be added to the books: more task-based activities according to the topic of the books can be added to each chapter along with information about the kind of platforms that those tasks can be implemented on; supporting websites containing an inventory of different types of task that the teacher can choose from; videos of teaching materials that can be used for OFL classes as home-teaching materials before each session; specific worksheets for OFL classes; and an inventory of problem scenarios that teachers can choose based on the mindset of the students.

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