



The Effect of Technology-aided Project-based Learning on EFL Learners' Self-Regulation and Language Proficiency



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ABSTRACT

To help students progress in today's technology-aided competing universe, along with fostering knowledge acquisition in any particular field, educational systems are supposed to incorporate 21st century skills into teaching to fill the gap between students' knowledge of the field and the competencies required to use the acquired knowledge. This study sought to explore whether the incorporation of technology and project-based learning into the mainstream English teaching classrooms contributes to the development of linguistic competence as well as self-regulation, as one of the indices of 21st century learning. To accomplish such an objective, a quasi-experimental design was employed and two intact classes, including 68 Iranian learners of English, were assigned to an experimental and a control group. Along with benefiting from a multi-skill textbook-oriented language instruction, the participants in the experimental group dealt with a variety of small- and large-scale technology-aided projects. The control group's participants, on the other hand, received a multi-skill textbook-oriented language instruction in the absence of any technology-aided projects. All the participants were gauged in terms of English proficiency and self-regulation, before and after receiving the instruction. Based on the comparative results drawn from an analysis of covariance (ANCOVA), the technology-aided project-based instruction of the study improved the participants' level of self-regulation and language proficiency.

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1. Introduction

Living in the 21st century, the era of digits, multimedia programs, virtual connections, and modern thinking, has compelled people to acquire a basic knowledge of Information and Communication Technology (ICT). Being fully integrated into the life of today's people, ICT has been widely used to help societies tackle with the diversity of thoughts and cultural values (Marczak, 2013). Due to the incorporation of ICT in today's interactional world, there is a desperate need for cultivating a variety of innovative skills, referred to as "21st century skills" (Varis, 2007). These skills, as elucidated by Sawchuk (2009), are a combination of technology literacy, the ability to work collaboratively, and the ability to analyze and apply knowledge. Notwithstanding the diversity of opinions about skills that can qualify as 21st century skills, there is a clear consensus about the positive impact of such skills on learners' progress in different fields such as economy, science, society, flow of information, and education (Dede, 2010).

Owing to the rapid global swing toward digital literacy in the 21st century, the education system, and the roles and routines thereof, have undergone a number of drastic changes (Robinson & Aronica, 2015). Nowadays, students, as asserted by Nissim et al. (2016), are "no

longer to be seen as a passive receptacle for knowledge, but instead as an active participant in the construction of knowledge" (p. 29). Bringing about a fundamental shift in education from a teacher-centered pedagogy to a learner-centered one, this educational reform has yielded the prevalence of self-directed learning (SDL) (Wolters, 2010). SDL, known also as self-motivated and self-teaching learning, is referred by Sefton-Green (2004) to the self-management process of content learning through a variety of specific skills and strategies. Self-regulation, as one of the various skills contributing to SDL, is a cover term concerned with a variety of processes that allow individuals to exert control over their beliefs, emotions, and actions (Schmeichel & Baumeister, 2004).

As contended by Long (2000), self-regulation encompasses a variety of processes including goal-setting, self-instruction, self-selection (of learning strategies), self-monitoring, and self-evaluation. Based on the well-established model proposed by Zimmerman (2006), self-regulation is achieved as a result of several successive processes including goal-setting, planning, self-motivation, attention, control, flexible use of strategies, self-monitoring, help-seeking, and self-evaluation. Zimmerman (2006) believes that self-regulatory processes are found to help people acquire a specific content

knowledge more effectively. This view has been corroborated by several empirical studies which came to a conclusion that self-regulatory qualities significantly contribute to learners' performance in different domains such as sports, music, and academic achievement (e.g., Meshkat & Shabani, 2014; Nota et al., 2004; Schunk, 2005).

In accordance with the drastic changes made in educational systems worldwide, modern language teaching pedagogy inevitably needs to hold self-regulatory learning in high regard. Project-based language learning (PBL), as a learning style that organizes learning around projects, is viewed as a breakthrough in 21st century learning and facilitates the realization of student-centered classrooms by virtue of active participation. (Astawa et al., 2017; Bell, 2010). PBL has been widely accepted as an effective approach to cultivating both 21st century and language learning skills (Fandiño, 2013). Being evaluated as an effective learning model which helps learners analyze problems, investigate possible solutions, make decisions, create designs, and solve problems, PBL is presumed to be capable of incorporating 21st century skills into an English as a foreign language (EFL) classroom (Gardner, 2000).

As reflected in Gardner's (2000) exhortation, the involvement of learners in group projects promotes peer cooperation, self-directed reactions to a learning task, active participation in

language learning, and idiosyncratic knowledge reflections. Every individual exercise and activity throughout the coursebook has the potential to be converted into a project that entails real engagement in higher-order thinking. For instance, a classroom task revolving around a particular structure could be regarded as a group project whose accomplishment is very likely to yield a thorough mastery of the target structure. Going through a sequence of purposeful processes including planning, sharing the responsibilities, putting the plan into action, conducting either self or peer assessment of the results, and reporting the outcomes, students could forge a relationship through which the development of various social and communicative skills may take place (Bell, 2010).

The abundance of the empirical data on the contributory role of PBL in developing 21st century skills and acquiring different sorts of content knowledge (Astawa et al., 2017; Bell, 2010; Takeda, 2016) accentuates the necessity of conducting research into the workable ways of incorporating a project-based instruction into the mainstream ones. To incorporate PBL, as an add-on to the conventional teaching/learning methods, there is a need to overcome a number of obstacles such as tight schedules and crowded classrooms (Simpson, 2011; Thuan, 2018). Acting as a means of facilitating project implementation, technology is deemed to be useful for surmounting the

obstacles in the way of PBL. Recent research (Bernacki et al., 2020; Chen & Hsu, 2020) shows that the use of technology in the educational landscape not only facilitates content learning but also improves motivation for learning.

As far as project-based language learning is concerned, technology facilitates the conveyance of the target content and, at the same time, is very likely to have a direct bearing on different language learning skills (Black, 2009). As maintained by Black (2009), a synthesis of PBL and ICT has the potential for a simultaneous cultivation of knowledge enhancement, team working, and problem solving ability. The majority of proponents of ICT-based PBL also suggested that this type of learning is helpful in motivating learners and encouraging their interest in learning (Cox, 2014; Fragoulis, 2009; Peterson & Nassaji, 2016). As believed by Darling-Hammond et al. (2017), benefiting from technology, teachers can evaluate learners' progress more readily and provide feedback exclusive to every individual.

The dual role of technology in facilitating PBL and motivating learners has provided many TEFL scholars (e.g., Dooly & Sadler, 2013; Marwan, 2015; Pilten et al., 2017; Sidman-Taveau, 2005) with an incentive to explore the efficacy of a technology-aided project-based instruction. Nonetheless, the majority of the previously-conducted studies mainly focused on learning achievements and neglected the possible

changes in 21st century skills. The present study, therefore, aimed at exploring the impact of applying technology-aided PBL practices on Iranian intermediate EFL learners' language achievement in terms of a combination of the four major language learning skills (i.e., reading, writing, speaking, and listening). As its second aim, the study sought to investigate the effect of technology-aided PBL on EFL learners' level of self-regulation. In line with the two objectives enumerated above, the following research questions guided the current study.

1. Does the incorporation of technology-aided project-based learning into EFL classrooms influence Iranian EFL learners' language proficiency?
2. Does the incorporation of technology-aided project-based learning into EFL classrooms influence Iranian EFL learners' self-regulation ability?

2. Method

Design of the Study

To address the research questions, a quasi-experimental pretest-posttest control group design based on a quantitative analytical approach to data analysis was employed whereby the participants' self-regulation abilities were measured before and after receiving the study treatment (technology-aided PBL). Furthermore, aside from measuring the participants' initial proficiency in English, the gains in their English proficiency was gauged

through a course-based multi-skill achievement test at the conclusion of the study course. The pretest scores were then regarded as the covariate variables and the experimental and control groups were compared in terms of the post-treatment scores.

Participants

Employing convenience sampling method, two intact classes, including 68 Iranian learners of English from Avid language school in Tehran, Iran, were recruited to take part in the study. One of the two intact classes, including 35 learners, was randomly assigned to the experimental condition of the study, whereas the other one, containing 33 learners, was regarded as the control group. The homogeneity of the participating EFL learners was assured choosing intact classes of the same proficiency level and administering the Preliminary English Test (PET). The PET scores fell between 140 and 160, indicating that all the participants were intermediate learners of English. The study chose to be focused on female learners (average = 19.7) owing to some practicality concerns (the necessity of gender separation). All the participants had studied English solely within the educational system of Iran and none of them had already benefited from educational ICT tools in a classroom. Aside from the EFL students who took part in the study, an experienced IT expert (male) was recruited to be consulted about the appropriate ICT tools, and the operating instructions

thereof.

Instructional Materials

In accordance with the participants' level of English proficiency (i.e., intermediate), the instructional content of the first four units of the book *Touchstone* (Level 4, 2nd ed.) by McCarthy et al. (2014) constituted the core content of the study course. In addition to the instructional content of the textbook, the participants in the experimental group worked on a total of 24 short-scale and seven large-scale projects. The projects were designed based on the topics covered by the textbooks (see the Appendices). Since technology was regarded as the means of project implementation, a number of audio/video tutorials, containing comprehensible instructions on the use of the target ICT tools (i.e., WhatsApp, Wiki, Blog, Microsoft Word, PowerPoint, and Movie Maker), were developed in consultation with the IT expert. The length of the video tutorials varied between 10 and 20 min. Furthermore, a 20-min. video lecture was provided to raise the participants' awareness of the characteristics, principles, and methods of PBL. The participants were asked to watch the video tutorials at home.

ICT Tools

Drawing on the language teaching/learning ICT tools proposed by Sharma & Barrett (2007) and Lewis (2009), the current study took advantage

of both online (WhatsApp, Wiki, and Blog) and offline (Microsoft Word, PowerPoint, and Movie Maker) ICT tools to facilitate PBL. As a popular and user-friendly instant messaging application, WhatsApp played a central role in facilitating both learner-learner and teacher-learner communication and provided the group members with chances to constantly receive proper corrective feedback from their peers and instructor. The participants also took advantage of wikis and blogs, as two instances of Web 2.0 technologies, while rendering the large-scale projects. Microsoft Word, PowerPoint, Movie Maker, and Longman Dictionary (6th ed.) were also used to assist the learners in accomplishing the projects.

Instruments

PET

To get assurance as to the homogeneity of the participating individuals in terms of English proficiency, the pen and paper version of the PET (Cambridge ESOL examination, 2004) was administered at the outset of the study. The scale contained a total of 92 questions to evaluate the participants' knowledge of English focusing on their proficiency in listening (25 questions), speaking (25 questions), reading (35 questions), and writing (seven questions). A PET score ranging between 140 and 160 (out of 170) indicates that the test taker enjoys an intermediate-level proficiency in general English. As reported by

Cambridge English Quality and Accountability (2016), PET is a reliable ($\alpha = .92$) measure of overall proficiency in English.

Course-based Multi-Skill Achievement Test

The learners' English proficiency at the conclusion of the study course was gauged using a multi-skill course-based test. The test, regarded as one of the post-treatment measures of the study, was developed by the institute (Avid Language School) based on a level-appropriate testing program offered by the Touchstone publisher (i.e., Cambridge University Press). Being comprised of different types of questions (i.e., multiple choice, true/false, open ended), the test measured the learners' achievement in listening (10 points), vocabulary (18 points), grammar (16 points), writing (3 points), and reading (3 points). The overall scores, therefore, fell between 0 and 50.

The validity and reliability of the test was presumed to be self-evident, inasmuch as the items constituting it were all extracted from the Touchstone placement testing package developed by Cambridge University Press. To establish instrument reliability, the test was administered to a pilot sample including 15 EFL learners enjoying characteristics similar to those of the main sample. Statistical analysis of the pilot data through Kuder-Richardson 20 (KR-20) formula showed that the test

enjoyed an acceptable degree of internal consistency ($r = .79$).

Self-Regulation of Learning Self-Report Scale (SRL-SRS)

Another instrument utilized in the study was a 50-item questionnaire, namely Self-Regulation of Learning Self-Report Scale (SRL-SRS). The SRL-SRS measures learners' self-regulation of learning, comprising six subscales including planning (nine items), self-monitoring (eight items), effort (10 items), self-efficacy (10 items), evaluation (eight items), and reflection (five items). The questionnaire was the Persian translation of the inventory designed by Toering et al. (2012) to measure learners' self-regulation of learning. It provides an overall self-regulation score employing three different Likert-type scales including a) a four-point scale from almost never (1) to almost always (4) to measure planning, self-monitoring, effort, and self-efficacy; b) a five-point scale ranging from never (1) to always (5) to gauge evaluation; and c) a five-point scale ranging from strongly disagree (1) to (5) strongly agree to judge the degree of reflection in learning. The overall self-regulation score, therefore, may range from 50 to 213. The reliability testing results on the pilot group also indicated an acceptable degree ($\alpha = .77$) of internal consistency within the instrument. It is worth mentioning that the reliability and validity of the original version of the SRL-SRS have been previously established by Toering et al. (2012).

(2012).

Data Collection Procedure

As the preliminary stage of the training, video tutorials were recorded with the consultation of the IT expert to provide the participants with the knowledge of employing the target ICT tools. As another preliminary step in the data collection procedure, the participants were asked to complete the two instruments of the study (PET and SRL-SRS) to measure their initial proficiency in English and self-regulatory abilities. They, subsequently, took part in a semester-long multi-skill English course. The course was held twice a week throughout a full instructional semester (i.e., three months).

To maximize the internal validity of the study, the same instructor and instructional content (textbook) were used and the class time in both groups of the study was mainly devoted to teaching the instructional content of the textbook. As the only distinction, the learners in the experimental group were asked to work on a variety of ICT-aided projects, in parallel with receiving the text book-oriented language instruction. Each large-scale project (e.g., interviewing with a family member and making a video) was scheduled for completion during a period of two weeks, whereas every short-scale project (e.g., framing three interview questions to probe into an interesting life experience) was planned to be accomplished within the span between

every two training sessions of the course (see all the projects in the Appendix).

Before implementing the study treatment, the experimental group was virtually split into small groups of three or four learners. The rationale for virtual grouping of the learners, as done through WhatsApp, was to facilitate interactive working on the target projects both inside and beyond the actual setting of the classroom. The experimental group's participants then received an extra technology-assisted instruction on the use of a number of ICT tools as well as the principal features of PBL through the pre-planned video tutorials. Subsequently, the predetermined course-driven (both short- and long-scale) projects were assigned to every virtual group via WhatsApp. While the whole process of working on every short-scale project was handled through WhatsApp, the large-scale projects demanded the use of more instances of ICT tools (i.e., wikis, blogs, etc.).

According to the PBL video tutorial, the members of the experimental group went through a number of successive project-completion processes including a) thinking on the procedure required to tackle the problem, b) making use of their instructor's guidance on the procedure, c) recognizing and brainstorming the task's objectives, d) consulting with their teammates about possible ways to collect relevant materials and information, e) sharing the responsibilities among the group's

members, and f) making use of the predetermined ICT tools. Throughout the course, the instructor and the IT expert maintained contact with the learners in order to facilitate their use of various offline and online tools. The instructor was also responsible for facilitating cooperation between the groups' members, providing them with adequate guidance on self-assessment, peer-assessment, and social skills valued for making success in group working. The learners were required to virtually submit a detailed report of their progress to the instructor. Contrary to the treatment implemented in the experimental group, the control group received the conventional type of teaching proposed by the Touchstone teachers' guide book, in the absence of any technology-aided projects. At the conclusion of the study course, the participants' levels of English proficiency and self-regulation were measured for a second time, administering the course-based achievement test and the SRL-SRS respectively.

Data Analysis Procedure

Statistical package for social sciences (SPSS, version 22) was utilized to estimate the descriptive and inferential statistics required to address each of the research questions. In order to compare the experimental and control groups' performance while controlling the impact of any initial between-group differences, one-way analysis of covariance (ANCOVA) was run.

3. Results

The first question of the study was intended to examine whether or not the incorporation of technology-aided PBL into EFL classrooms influences Iranian EFL learners' language proficiency. To address this question, the experimental and control groups' achievements in the PET and course-based test were compared, estimating the central tendency and dispersion measures displayed in Table 1.

Table 1. Descriptive statistics of the participants' performance in the PET and course-based achievement test

Variable	Group	N	Min	Max
Mean	SD	Skewness	Kurtosis	
PET				
Scores	Experimental	35	144	
160	152.18	4.79	-.15	-.38
Control	33	142	159	
151.26	4.18	-.18	-1.16	
Achievement				
Experimental	35	34	48	
42.11	3.88	-.38	-.84	
Control	33	32	47	39.67
3.77	-.04	-.40		

As shown in Table 1, the experimental group's performance on the PET (M = 152.18, SD = 4.79) was partially better than that of the control group (M = 151.26, SD = 4.18). Additionally, the participants of the experimental group

outperformed their counterparts in the control groups in terms of the achievement scores (experimental group: M = 42.11, SD = 3.88; control group: M = 39.67, SD = 3.77). The between-group comparative results testified to a more remarkable difference between the experimental and control groups in terms of the achievement scores.

To investigate whether or not the between-group difference found on the descriptive level gains statistical significance, a one-way ANCOVA was performed on the posttest achievement scores. It is worth mentioning that the PET scores were regarded as the covariate variable while comparing the achievement scores between the two study groups. Before conducting the ANCOVA, its underlying assumptions (i.e., normality, homogeneity of variances, homogeneity of regression slopes, and linearity of the relationship between covariate and dependent variables) were checked and no violation was found. The ANCOVA results are presented in Table 2.

Table 2. Results of a one-way ANCOVA on the achievement scores

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	754.60	2	377.87	78.09	.000	.706
Intercept	247.24	1	247.24	51.17	.000	.431

PET Scores	652.84	1		
	652.84	135.13	.000	.675
Method	161.05	1		
	161.05	33.33	.000	.339
Error	314.04	65	4.83	
Total	114967.00	68		
Corrected Total	1068.63	67		

The results in Table 2 revealed a significant main effect for the factor representing the two instructional methods implemented throughout the course, $F(1, 65) = 33.33, p < .001, \eta^2 = .339$. In simpler terms, the difference between the experimental and control groups was found to be statistically significant. The measure of effect size, shown as partial eta squared, was found to be moderate based on Cohen's (1988) interpretation of effect size. The effect size value indicated that the instructional method the participants were exposed to could account for approximately 34% of the variance in the achievement scores.

As shown in Table 3, the mean scores estimated based on the post-treatment scores after detaching the covariate effect (adjusted the mean) indicated that the participants in the experimental group significantly outperformed their counterparts in the control one. Accordingly, the incorporation of technology-aided project-based learning

into EFL classrooms appeared to have significant effect on Iranian EFL learners' language achievement.

Table 3. Marginal means of the achievement scores

Method	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
technology-aided PBL	42.43	.37	41.68	43.17
Conventional	39.33	.38	40.10	38.57

The analytical procedure for addressing the second question of the study was much the same as what was followed to address the first one. As the only difference, the data were generated through the pre- and post-treatment administration of the SRL-SRS. Table 4 depicts the descriptive statistics of the pre- and post-treatment self-regulation (SR) levels in the two groups of the study.

Table 4. Descriptive statistics of the participants' performance on the SRL-SRS

Variable	Group	N	Min	Max
Pretest Scores	Experimental	176	150.43	13.81
	Control	33	118	176

150.48	15.02	-.23	-.65
Posttest Scores	Experimental		
35	128	181	156.60
			14.21
			.29
			-.90
Control	33	120	178
	151.09	14.87	-.26
			-.57

A pairwise comparison of the groups' initial SR levels indicates no remarkable difference between them (Experimental: M = 150.43, SD = 15.02; Control: M = 150.48, SD = 15.02). Nonetheless, the between-group difference was found to be conspicuous regarding the learners' post-treatment SR levels (Experimental M = 156.60, SD = 14.21; Control: M = 151.09, SD = 14.87).

After making sure that the preliminary assumptions were satisfied, a one-way ANCOVA (as shown in Table 5) was ran to explore whether or not the between-group difference in terms of the post-treatment SR levels is statistically significant.

Table 5. Results of a one-way ANCOVA on the SR levels

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	11535.75	2	5767.87	128.18	.000	.798
Intercept	214.71	1	214.71	4.77	.033	.068
Pretest Scores	11020.24	1	11020.24	244.90	.000	.790

Method	524.99	1	
	524.99	11.67	.001
			.152
Error	2924.88	65	45.00
Total	1625609.00	68	
Corrected Total	14460.63	67	

According to the results displayed in Table 5, there was a significant difference between the experimental and control groups in terms of the post-treatment SR levels, $F(1, 65) = 11.67$, $p < .01$ partial $\eta^2 = .152$. The effect size value showed that the different methods the groups benefited from were responsible for 15.2 percent of the between-group variances. The means evaluated based on covariate-free data (marginal means), as depicted in Table 6, revealed that the experimental group significantly outperformed the control one in terms of SR level. Consequently, the incorporation of technology-aided project-based learning into EFL classrooms proved effective on Iranian EFL learners' self-regulation ability.

Table 6. Marginal means of the post-treatment SR Levels

Method	Mean	Std. Error	95% Confidence Interval
			Lower Bound
			Upper Bound
technology-aided PBL	156.62	1.13	154.36
			158.89

Conventional 151.06 1.17
148.73 153.39

4. Discussion and Conclusion

Based on the findings, the incorporation of a technology-aided project-based instruction into a conventional multi-skill EFL program yielded greater levels of both English proficiency and self-regulation among the participants. The findings are in line with the previously-drawn empirical data (e.g., Astawa et al., 2017; Baş, 2011, Collier, 2017; Fragoulis, 2009) showing that the incorporation of PBL into language teaching leads to higher levels of learning. A close look at the empirical data revealed that the efficacy of PBL in promoting language learning attainment is mainly attributed to its likely consequences such as active participation and engagement (Wongdaeng & Hajihama, 2018), motivation for learning (Khalili Sabet & Ravand, 2017), and autonomous learning (Simpson, 2011).

Additionally, maximizing learners' involvement in learning the target instructional content, ICT-based projects seems to have the potential for learning motivation enhancement. The use of projects may have provided the experimental students with the opportunity to be involved in a meaningful communication while benefiting from authentic language resources and materials. Being exposed to both written and oral authentic language input, the learners of the

experimental group were compelled to produce the final products (output) in collaboration with their team-mates. This may have led them to engage upon a lengthy process of authentic language reception and production in a variety of real-world settings. Research (e.g., Fragoulis, 2009; Simpson, 2011) shows that the integration of activities which facilitate authentic use of language in classrooms contributes to higher levels of language learning achievement.

The positive influence of the treatment of the study on self-regulation ability sounds quite justifiable given the SRL theory proposed by Zimmerman (2006) whereby self-regulation is presumed to be the fruit of self-generated beliefs, emotions, and behaviors that are planned and adapted based on performance feedback to achieve self-established goals. Based on this theory, to experience a self-regulated learning, learners need to go through several sub-processes such as planning, self-monitoring, effort, self-efficacy, evaluation, and reflection. Since the participants' self-regulation levels were measured based on a synthesis of the six sub-component of a self-regulatory learning enumerated by Zimmerman (2006), a follow up analysis was performed and the changes in every individual sub-component were evaluated to cast more light on the findings. Based on the results, at the conclusion of the study course, the participants improved remarkably in terms of self-efficacy, planning, and

evaluation. These results suggested that the projects may have encouraged the experimental groups' members to embark on collaborative planning of the procedure before stepping into their roles, as group members. Furthermore, working collaboratively with peers to achieve a common goal, the learners of the experimental groups were more likely to make more efforts. On the other hand, allowing learners to continuously monitor and evaluate their own and peers' performance/progress while proceeding with the pre-determined projects, technology seems to have the potential for fostering evaluation. The improvement found in self-efficacy levels of the experimental groups' participants is in harmony with that of Pilten et al. (2017) mixed-method research showing that ICT-assisted PBL practices yield to higher degrees of self-efficacy.

Aside from PBL, the empirically-validated contribution of technology in the development of language learning achievement (e.g., Aharony, 2015; Dobler, 2015; Girlando & Eduljee, 2016), self-directed language learning (e.g., Bagheri et al., 2013; Savage et al., 2009), and self-regulation of learning (Gerlach, 2008; Rahman et al., 2010) may account for the positive changes found in the experimental groups' language proficiency and self-regulation. Acting as a catalyst for the realization of PBL in a limited-time multi-skill course of English, technology, and the use thereof, may

have enabled the learners taught under the experimental condition of the study to exploit the full potential of PBL.

In addition to its central role in facilitating PBL, the use of ICT in the current study may have profited the experimental groups' learners to take an active and independent role in processing the content-oriented materials. Such profound input processing is very likely to yield higher levels of attainment as found in the current study. Moreover, the use of ICT may have contributed to effective language learning, boosting learner-learner interaction (cooperation) while working on the pre-determined projects. What prompts such speculation is the Gillespie's (2006) claim that taking advantage of ICT tools to interactively gather information required to accomplish assigned tasks, learners can improve in terms of collaborative task-based learning (TBL). Acknowledging Vygotsky's (1978) sociocultural theory, it could be proposed that collaborative interaction among the peers while being involved in the content-oriented projects could add new knowledge and understanding to the experimental learners' prior knowledge of a topic area. Furthermore, facilitating a continual monitoring mechanism, the use of technology helped the instructor to make sure of the experimental group's concerted effort to constantly use English as the means of communication within the learning groups. Such purposeful collaboration,

in turn, may have provided room for receiving peer revision and corrective feedback in different stages of the projects, which may, in turn, have yielded significant modifications in the learners' productions.

To explain the positive impact of technology on the performance of the experimental group, the wide-ranging benefits of ICT in EFL classrooms could be referred to. Having made a rather recent attempt to portray these benefits from different scholars' (e.g., Kassim & Zuraina, 2007; Lee, 2005; Richardson, 2008) view point, Azmi (2017) came to a conclusion that the use of ICT in EFL classrooms promotes learning. The salient advantages of ICT implementation in language classrooms, as enumerated by Azmi (2017), included (a) increasing motivation for and engagement in language learning, (b) promoting autonomous learning, (c) boosting multisensory delivery and authenticity, and (d) maximizing interaction and communication. Admitting that learners are supposed to possess an acceptable level of self-regulatory in order to reach a self-directed type of learning (Schmeichel & Baumeister, 2004) and acknowledging the claim that SRL is the salient domain of self-regulation closely aligned with academic goals (Ernesto, 2017), the improvement found in the participants' self-regulation levels could be rooted in the self-regulatory ICT-managed learning environment of the present study.

Given the blended nature of the study treatment, which took advantage of both ICT and PBL to consolidate a textbook-oriented language instruction, the significant improvement found in the participants' level of language proficiency and self-regulation could be attributed to the cumulative effect of technology use, PBL, and textbook instruction. The efficacy of technology-aided PBL (as revealed in the current study) provided additional support for the study done by Sidman-Taveau (2005) who examined language learning development among a number of adult participants exposed to a computer-assisted PBL and came to a conclusion that their competence in reading, writing, listening, and speaking skills was enhanced. The finding is also in harmony with those of Dooly and Sadler's (2013) and Marwan's (2015) qualitative studies on the efficacy of a technology-enhanced project-based language learning (TEPBLL) in second language learning.

The concluding remarks made by the current may be beneficial to the broad range of teachers, scholars, and authorities involved in English language pedagogy. The findings suggested that by virtue of a variety of ICT tools, there is a real possibility for a departure from teacher-centered EFL teaching methods. Compensating for the lack of time, as the salient excuse for balking at learner-centered approaches, the use of various user-friendly technological tools not only facilitates working on a variety of

content-relevant projects, but also lays the foundations for an effective learner-learner/teacher-learner interaction. The probable outcomes of such technology-aided interaction (i.e., learner engagement, collaboration, learning motivation, and so on) seem to have the potential for acting as a lever to keep the wheels of English pedagogy turning on the 21st century learning road.

The findings of the current study may have been affected by several limitations such as the short period of the instruction and the impracticality of random selection of the participants. Replication of the study on a larger randomly-chosen sample of EFL learners involved in technology-aided PBL for a lengthier time span may cast more light on what has been found in the current study. Researchers motivated to expand upon the findings are recommended to take account of teacher and learner attitudes toward the advantages, disadvantages, and practical constraints of a technology-aided project-based method of language teaching/learning to provide a vivid picture of its efficacy, as an alternative to the present teacher-centered EFL instructions.

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Appendix

The Content-relevant Projects of the study

Unit 1

General Title	Function	Short-scale Project	Large-scale Project (LSP)
Presentation Format for LSP			

Interesting Lives 1. Asking questions to find out about someone's interest and background

2. Telling interesting stories about your/someone's life 1. Free discussion (in groups) to decide on three main areas (e.g., occupation, travels, hobbies or interests, life experiences, etc.) which lead to an interesting life.

2. Framing three interview questions to probe into an interesting experience of an imaginary interviewee.

3. Conducting interview in groups using

the questions framed in the previous sessions.

4. Writing a short anecdote using six randomly-assigned verbs chosen from Dan's story.

5. 5. Developing a conversation similar to Juan and Bryan's about a scary experience.

6. Discussing in groups about success and the ways people can make success through which. 1. Developing a biography of a local celebrity

2. Conducting a structured interview with a person from your relative or friends accepted by the group to have an interesting life. • A wiki

• A short video created by Windows Movie Maker

Unit 2

General Title Function Short-scale Project Large-scale Project (LSP) Presentation Format for LSP

Personal Tastes 1. Talking about makeovers, style, and fashion

2. Talking about your tastes in clothes and music 1. Giving characters of the lesson a makeover according to the pictures and content.

2. Practicing just as ...as or not as as structure in groups based on randomly selected nouns related to appearance.

3. Writing a conversation in which a pair of persons (mother/daughter,

wife/husband, etc.) with different tastes are shopping for clothes.

4. Free discussion in groups about the members' favorite clothes for special occasions using guesswork.

5. writing a conversation similar to Tracy and Omar's through brainstorming different interests (e.g., sports, clothes, books) for which each group member might buy people gifts.

6. Conducting a structured interview in groups discussing these questions: Do you think everyone has a personal style? Do you wear clothes similar to those worn by everyone else, or do you try to be different? How would you describe your personal style? 1. Conducting a comparative research on the favorable outfits of two celebrated politicians.

2. Making a visual report of the group's preferred outfits for different occasions 1. A narration-assisted Power Point file

2. A blog

Unit 3

General Title Function Short-scale Project Large-scale Project (LSP) Presentation Format for LSP

World Culture 1. Talking about aspects of someone's culture

2. Talking about manners, customs, and culturally appropriate behavior. 1.

Preparing a short talk on a traditional food that a visitor to Iran should not miss.

2. Free discussion on the places the group

members have visited describing the events, monuments, food, and etc.

3. Writing an argumentative essay about the lists of Dos and Don'ts according to an Iranian culture.

4. Preparing a list of social behavior have changed today compared to the past.

5. Writing and presenting a conversation similar to Hilda and David's, beginning with If I lived abroad

6. Brainstorming in groups to make a list of reasons for living away from home.

1. Making a travel brochure to introduce your city (or any other city) to visitors from other countries.

2. Making a detailed picture-based report of Iranian costumes throughout recent 100 years

1. Electronic brochure (e-brochure in Microsoft Word).

2. A narration-assisted Power-point file

Unit 4

General Title Function	Short-scale
Project	Large-scale Project (LSP)
Presentation Format for LSP	

Socializing 1. Talking about things you are supposed to do, things you were supposed to do, and things that are supposed to happen

2. Talking about going out and socializing

1. Telling anecdotes about activities or events that each of the group members were supposed to take part in at some time in the past (e.g., childhood, high school, more recent past) and then did not.

2. Searching for extra vocabulary for inseparable phrasal verbs with get (i.e., get along with someone, get back from a place), using Longman dictionaries (either print or online version).

3. Writing a short conversation similar to that of the lesson, using as many as inseparable verbs with get which have already been found by the group members.

4. Preparing an anecdote about a surprising party that one of the group's member has organized for someone else recently.

5. Writing and discussing five questions on the topic of birthdays (e.g., Do you always do something special for your birthday?).

6. Free discussion about the group members' reactions to a situation in which they just got some really great news. (e.g., They won a lot of money)

Conducting a research on social life of a historical figure and creating a video biography of that person. The video is intended to be accompanied by narration.

7. A short video created by Windows Movie Maker