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Enhancing Creative Thinking, Critical Thinking, and Interactional Skills through Problem-Solving Group Projects among Undergraduate English Majors in Japan

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ABSTRACT

This paper discusses how group problem-solving projects can enhance learners' creative and critical thinking skills while improving their interactional skills. According to the L2 literature, intensive use of such tasks can facilitate an optimal L2 learning environment that promotes a range of effective learning behaviours. Problem-solving tasks help learners achieve linguistic, affective, and social learning goals critical to L2 learning. This paper reports a mixed-methods study comparing the effects of such projects with those of teacher-led activities that maximised student interactions, both of which are deemed effective for L2 learning because they motivate language use. Participants consisted of two intact classes each with 24 third- and fourth-year English majors in a private university in Japan. Each task took up 50 minutes of a semi-content-based course. Results indicate that the projects significantly improved participants' creative, critical, and L2 interactional skills compared with teacher-led activities. Participants' feedback also revealed pedagogic benefits of group problem-solving projects of value to other educational settings.

Keywords: critical thinking skills; creative thinking skills; interactional skills; self-regulation; self-efficacy

INTRODUCTION

There has been a growing move toward stressing creative and critical thinking skills as 21st century requirements in the second language learning curriculum worldwide (Li, 2020a). These skills are essential for self-regulated learning, thinking logically, and working effectively. Creative and critical thinking skills are also key to engaging in global communication in addition to critically and creatively thinking about problems, solving them, and creating new knowledge and understanding (Jones, 2016). In second language acquisition, the primary emphasis is now placed not on remembering and recalling language learned but on the acquisition of skills needed for critically and creatively analysing language "in order to internalise and appropriate the language" (Li, 2016, p. 267). To do so effectively, learners can engage in joint projects designed to solve problems (Li, 2020a) involving metacognition, effort, and self-regulation.

More recently, a similar move has emerged in the secondary school curriculum in Japan with the aim not only of improving the L2 but also—and crucially—of enhancing all three skills, namely creative thinking, critical thinking, and L2 interactional skills. This initiative was driven by Japan having fallen behind other Asian countries in TOEFL iBT scores (ETS, 2020; Ministry of Education, Culture, Sports, Science and Technology – MEXT, 2018) and continuing to rank among lowest-scoring countries (105th/115; ETS, 2020). This suggests that secondary school and university English language teaching in Japan has not been entirely successful (MEXT, 2018). Data show that students have not adequately improved their English skills, including creative, critical, and interactional skills. Likely reasons identified by Nishino and Watanabe (2008) and Onoda (2015) are: 1) small number of class meetings (typically 150 per year at secondary level);

2) large class size (approximately 40 per classroom) with little interaction with teacher or peers; 3) use of grammar translation and of the L1 to teach English for university entrance examinations; 4) lack of intrinsic motivation (i.e., little need to study or use English for communication within Japan); 5) insufficient teacher education in undergraduate training courses, hence lack of understanding of effective teaching approaches; 6) little to no emphasis on creativity, criticality, or L2 interactional skills; and 7) curricular limitations at university level, with courses not designed to foster creativity, criticality, or interaction due to imbalance between the four strands of teaching: meaning-focused input, meaning-focused output, language-focused learning, and fluency development (Nation, 2013).

According to Tomlinson (2021), other factors affecting underperformance in Japanese secondary school and university teaching contexts include learners being:

1) Rarely required by materials or teachers to be creative or critical in L2 use;
2) Encouraged to be language-focused and pay most attention to correct grammar and vocabulary;
3) Typically less confident when using the L2 because they are afraid of making mistakes (p. 6).

These factors explain why many Japanese university students have not developed advanced English proficiency, especially interactional skills, including fluent and accurate language use or the creative or critical thinking skills essential to L2 learning and authentic L2 interaction, both of which also instigate and maintain self-regulated learning (Borg, 2013; Onoda, 2019a), a secondary focus of this study.

Research in approaches to improving L2 creative, critical, and interactional skills remains limited (Li, 2020a; Onoda, 2019b), even in settings where task-based teaching has been adopted (Ellis, 2016; Rossiter et al., 2010). In response, this study addresses the following questions: 1) Do group problem-solving projects designed around oral fluency enhance creative, critical, and interactional skills? and 2) What other effects do such projects yield?

The following paragraphs review definitions of creative, critical, and interactional skills followed by a rationale for problem-solving group projects as a promising approach to improving such skills.

LITERATURE REVIEW

DEFINITIONS OF CREATIVE AND CRITICAL THINKING SKILLS

Definitions of creativity and criticality vary across researchers (Afshar, 2020; Li, 2016). Li (2020b) also shows that there is no consensus as to what creativity and criticality are or how best to encourage them.

However, close examination of L2 literature suggests that the most frequently adopted definition of creativity is a behaviour that produces "possibilities and new embodiments of knowledge" and generates novel ideas (McGregor, 2007) and denotes a process in which "one makes connections with ideas to produce new understanding, new relationships, and new concepts about issues" (Afshar, 2020, p. 196). This definition is similar to the one postulated by Tomlinson (2021) as "the ability to be innovative in thought and expression, to be inventive, to make original connections, to think of alternatives, to find solutions, and to make people laugh" (p. 1).

Similarly, criticality denotes a cognitive ability that includes evaluation, analysis, reasoning, inference, and problem-solving (Afsha, 2020; Li, 2016). This definition is conceptually close to the one proposed—albeit in more concrete terms—by Tomlinson (2021) as "the ability to analyse, question, deduce, infer, hypothesise, and evaluate information without accepting what they hear or read" (p. 2). The present study adopts the definitions of both creativity and criticality postulated by Tomlinson.

IMPORTANCE OF CREATIVE AND CRITICAL THINKING SKILLS

L2 literature (e.g., Ellis, 2016, Jones, 2016; Li, 2016; Richards & Cotterall, 2016) argue that creative and critical thinking skills are crucial to developing and using a second language. As Jones (2016) stresses, these skills are "at the heart of all successful communication" (p. 28). Li (2020b) argues that creative thinking skills facilitate language learning because they help "learners cope with novel and unpredictable experiences" (p. 197) and cites research (e.g., Yang et al., 2013) indicating significant improvements in speaking and listening through integrating creative and critical thinking skills in the teaching of both oral and written performance.

This argument partly derives from the positive effects of self-regulation on L2 learning. Self-regulation is widely purported to yield academic success (Pintrich & Zusho, 2002), in particular L2 proficiency development (Onoda, 2012a; Wang, 2007). When learners engage in self-regulated learning, several factors and learning strategies are deployed: self-efficacy, intrinsic motivation, creative and critical thinking, metacognitive self-regulation, and effort regulation (Onoda, 2012a; Pintrich et al., 1993). This confirms the predictions of social cognitive theory (Bandura, 1986), whereby self-efficacy has a strong positive impact on human behaviours, including L2 learning, as well as those of self-determination theory (Deci & Ryan, 2002), whereby humans are born with three innate desires to satisfy: autonomy, competence, and relatedness.

Further support for the importance of creativity and criticality comes from Tomlinson (2021), who argues that the rationale for improving such skills is that they: "(a) are educationally important targets; (b) are parts of the ability to use the L2; (c) stimulate the brain; (d) enrich input; (e) enrich output and auto-input; and (f) facilitate L2 acquisition and the development of communicative competence" (p. 4). In a similar vein, Avila (2015) shows that thanks to creative activities, Colombian students of all ages became more motivated to learn and use English, which helped develop their oral and written fluency and improved their creative thinking. In sum, as Tomlinson (2021) further argues, if teachers facilitate creativity and criticality, learners will:

1) Become confident in L2 use;
2) Become more motivated to use the L2; and
3) Willingly engage in interactions, thus becoming more autonomous and communicating in the L2 more effectively. (p. 14)

DEFINITION AND ROLE OF L2 INTERACTIONAL SKILLS

Though definitions of interactional skills vary across researchers, they agree on the ability to produce interactions appropriate to situations and interlocutors, which broadly equates to communicative competence and subsumes sociolinguistic, grammatical, discoursal, and strategic competence (Canale & Swain, 1980). Thus, for effective interaction to occur, four components need to be satisfied: accuracy, fluency, pronunciation, and communicative effectiveness (KEPT,

2007). Researchers (e.g., Derwing et al., 2007; Onoda, 2014; 2019b; Segalowitz, 2010) argue that of these four components, oral fluency and communicative effectiveness are especially crucial. Onoda (2015) and Sato (2012) further argue that pedagogical endeavours should aim to improve L2 interactional skills in both pre- and in-service English teachers. However, Nation (2014) and Segalowitz (2010) show that oral fluency has been neglected not only in Japan but also in many teaching settings worldwide and that learners' interactional skills have often failed to improve as required. In response, the present study focuses on L2 oral fluency as a major component of L2 interactional skills.

LINKS BETWEEN CREATIVE, CRITICAL, AND INTERACTIONAL SKILLS

As discussed above, L2 literature (e.g., Ellis, 2016; Jones, 2016; Richards & Cotterall, 2016) indicates that L2 creative, critical, and interactional skills are closely related key components of effective communication skills. Creative and critical thinking skills facilitate L2 learning, enrich input and output, and instigate authentic communication, thereby improving interactional skills (Li, 2020b; Tomlinson 2021).

From a task-based teaching perspective, Ellis (2016) argues that creative and critical thinking skills instigate and retain the motivation to interact with others, thus improving interactional skills. However, the reverse may also apply, with L2 interactional skills deploying and enhancing creativity and criticality.

The effects of creative and critical thinking skills on learning outcomes also derive from self-regulation in L2 learning. Self-regulation and L2 literature (e.g., Borg, 2013) shows that creative, critical thinking, and L2 interactional skills are closely interconnected. A host of studies indicate that intrinsic motivation derived from creativity and criticality predicts self-regulation (Deci & Ryan, 2000), which in turn predicts good learning results, including L2 interactional skills (Pintrich, Smith, García, & McKeachie, 1989). Other research (e.g., Onoda, 2012b; 2013) also shows the connection between creative, critical, and L2 interactional skills, with self-efficacy influencing the use of effort regulation strategies, which in turn impacts metacognitive strategies and creative and critical thinking skills and predicts improvements in L2 speaking and listening skills, i.e., L2 interactional skills.

Thus improving L2 creative and critical thinking skills leads to L2 interactional skills, clearly a worthwhile pedagogically significant endeavour.

RATIONALE FOR THE ADOPTION OF PROBLEM-SOLVING GROUP PROJECTS

L2 literature shows that group projects ranging from video production (Onoda, 2000) to group research (Onoda, 2019b) and problem-solving (Nation, 2013) improve creative and critical thinking skills and L2 interactional skills (Onoda, 2019a) because, according to Gras-Velázquez (2019), group projects activate the following skills:

1) Linguistic skills (e.g., interacting with one another);
2) Academic skills (e.g., creative and critical thinking skills);
3) Discussing and concluding (e.g., discussing an issue and choosing a conclusion or solution based on consensus);
4) Presentation skills (e.g., reporting the completed project to peers effectively and eliciting feedback).

Support for the effects of group projects derives from studies by Breidbach and Viebrock (2012) and Onoda (2019b). All suggest that group projects enhance all of the above-mentioned skills in addition to learner autonomy and self-efficacy. These effects derive from repetition of language items needed to discuss, negotiate, analyse, infer, evaluate, conclude, report, and respond while elaborating the project (Ellis, 2002). This forced repetition of language items, or "pushed output" (Nation, 2015), encourages learners to manage language both receptively and productively, thus enhancing deep processing and strengthening automatization while enhancing interactional skills. Such interactions also enrich the range of perspectives group members require in order to consider alternative approaches and thus go beyond the purely personal. In brief, learners also learn from one another, especially from "near-peer role models" (Murphey & Arao, 2001, p. 5). L2 literature (e.g., Maley, 2021; Nation, 2013; Onoda, 2012b, 2015, 2019b) supports this position by showing that when tuned to learners' proficiency and intellectual and motivational levels, the use of problem-solving group projects facilitates an optimal L2 learning environment thanks to the exceptionally wide range of skills it covers, including, in addition to the above, presenting information and ideas creatively and receiving and producing enriched output.

According to Tomlinson (2013) and Tomlinson and Masuhara (2018), from the important perspective of learner affect, problem-solving tasks facilitate learners' emotional engagement, enhance relevance and value as perceived by learners, providing adequate guidance and support for activity completion, encourage cooperative and social learning, and cater for individual preferences, thus challenging and stimulating learners.

In brief, group problem-solving projects offer a promising instructional, learner-centred approach that empowers learners to conduct research jointly, discuss focal problems using collectively-generated information, knowledge, and experience, apply these to developing viable solutions to defined problems, and reflect on such solutions by eliciting feedback from peers.

Accordingly, the present study addresses the following questions: 1) Do group problem-solving projects designed around oral fluency enhance creative, critical, and interactional skills? and 2) What other effects do such projects yield?

METHOD

INSTRUMENT

This mixed-methods study investigated the effects of oral fluency-focused group problem-solving projects over one academic year. Changes in creative and critical thinking skills were assessed based on a survey administered at the beginning and end of the research period. Data regarding L2 interactional skills gains were collected as KEPT (Kanda English Proficiency Test, 2007) speaking scores (see immediately below for details of the KEPT test). Participant feedback was elicited through interviews conducted with five focal participants from each of the control and experimental groups, each one consisting of an intact class taught by the researcher-author in order to triangulate the findings and interpret them adequately. Survey items were expressed in Japanese, as were all interviews, both being later translated into English by the researcher. The above data were supplemented by occasional notes on salient class observations by the researcher.

PARTICIPANTS

Participants were two classes of 48 English majors (control group: 24; experimental group: 24) taking third- and fourth-year semi-content-based courses in a private university in Japan during the 2015 academic year. Even though most participants aimed to become secondary school English teachers after graduation, with some wishing to study English teaching methodology and obtaining an MA in TESOL or applied linguistics in an English-speaking country, they took a limited number of English classes due to English Department requirements. Their English proficiency measured by TOEFL ITP ranged from 478 to 565 (control group: M = 524.35, SD = 12.31) and 448 to 575 (experimental group: M = 527.15, SD = 11.51). Their interactional skills represented by their fluency in English speaking skills were collected from the fluency scores of the KEPT Speaking Test. Their English interactional skills ranged from 2.7 to 4.2 (control group: M = 3.5, SD = .23) and 2.8 to 4.4 (experimental group: M = 3.6, SD = 12.31). The TOEFL test was administered two months before the research began while the KEPT test was administered at the beginning and end of the 2015 academic year, the aim for the latter pair being to assess any change in proficiency over the period. Despite the small sample size, Levene's test indicated that equal variance could be assumed (TOEFL: t = -.5.1, p = 65; KEPT: t = -.15, p = .52). Thus the two groups were deemed equivalent, and no statistical outlier was identified.

Approval was sought from university administrators for using students' TOEFL and KEPT data. Written informed consent was obtained from participants after the purpose of the research was explained to them in class in Japanese. Explanations and consent forms indicated that: 1) participation in the study would not affect participants' grades; 2) personal information, including names and test scores, would not be identifiable were the study to be published; and 3) participants could opt out of the study at any time. No participants in either class asked to withdraw, and all agreed to submit their TOEFL and KEPT data.

PEDAGOGICAL INTERVENTION

Both the control and experimental groups engaged in reading and learning about second language acquisition theories and teaching approaches from the textbooks: *Teaching ESL/EFL Speaking and Listening* (Nation & Newton, 2009a) and *Teaching ESL/EFL Reading and Writing* (Nation & Newton, 2009b) in the first 40 minutes of class time. They read a chapter, answered reading questions, and checked their answers by listening to the teacher's explanations.

Subsequently, 50 minutes of the 90-minute class time were devoted to two different tasks. The control group engaged in teacher-led demonstrations of group activities based on the textbooks, including reading, listening, and speaking skills. As the students reported in the subsequent interviews, engagement in the activities was highly valued and appreciated because they helped the learners connect theories to practical teaching ideas explicitly and intelligibly, thus deepening their understanding of the theories and teaching approaches. Meanwhile, the experimental group undertook group problem-solving projects involving all four language skills (reading, speaking, listening, writing). Once again based on the interviews, interactions were highly valued by the participants because they offered them a chance to use their knowledge of second language acquisition theories and approaches derived from the textbooks (Table 1).

TABLE 1. Tasks employed by learners

Tasks	***Both Groups***	
Common Tasks (40 minutes)	Reading the textbooks and answering reading questions (R, W) Checking their answers, listening to the teacher's explanations of L2 theories and teaching approaches, and discussing these in groups (R, L, S)	
	Following these common tasks, participants were guided in engaging in different types of group work.	
Different Tasks (50 minutes)	*Control Group* Teacher's demonstration of group activities based on the textbooks (R, L S, W)	*Experimental Group* Group problem-solving projects (R, L, S, W)

Notes: L = listening; S = speaking; R = reading; W = writing

Class activities (control group).
The following are three examples of activities demonstrated to the control group by the teacher.

1. Linked skills: This activity integrates three language skills successively. In a linked-skills activity, learners process the same learning material by using three of the four skills. For example, learners read a newspaper article online (reading), write about the main point and their reactions in a group (writing), and then discuss them also in a group (speaking). There are many combinations of successive skills. Repetition of the same information and lexis in three different modes improves fluency in the skill used in the third step, here, speaking.
2. Issue logs: An issue log is a record of information gathered from a wide range of sources over a sustained period of time. Learners decide on a topic they are interested in and look for information on it every week over an extended period. In class, they form groups of three or four and report the information and their reactions. Listeners respond to the report by giving the reporter feedback such as asking questions, agreeing or disagreeing with the reactions, or adding comments. Once this process is completed, students form new groups with different partners and repeat the process. The following week, they report different information on the same topic following the same procedure. This activity is beneficial in improving speaking fluency because the same expressions are used on the same topic.
3. 10 minute-writing: Given a topic by the teacher, for example "stress," learners think about any aspect of the topic for three minutes such as what causes stress for them and how they relieve stress and then write about their experience or ideas related to it as quickly as possible in 10 minutes without using an eraser. While this activity can be used simply as a writing fluency development, it can be also used as a pre-reading or pre-listening activity to activate the students' background knowledge about the reading or listening materials. They then form groups of three or four and based on what they wrote, exchange their ideas with one another, thus enriching the information relevant to the reading or listening materials.

Pedagogical intervention (experimental group).

Step 1: Participants formed groups of three and chose a problem related to English language learning or teaching proposed by a group of students as being typical of problems they might encounter in English language teaching in Japan. The following are some of the cases selected and worked on.

1) A 1st-year university student has weak L2 reading skills, reading almost word by word, so slowly that she immediately forgets what she read. She doesn't like reading, learning grammar, or vocabulary. How can you help her improve her reading speed and encourage her to read with ease and confidence?
2) A university student hates her English class, where she has to sit in the back row, which is full of students chatting in Japanese throughout class. She hears no English around her. She feels she is the only one there who speaks English. She feels like an idiot. This is true not only in this class but in other classes too. This university focuses on language and communication, but there are too many students who never practice English. She really hates these people…. What they write in their action logs and in the end-of-term questionnaire is ridiculous. They only pretend to be good students. She is sick of it.

Step 2: Participants thought of a number of possible solutions by drawing on theories, experience, and teaching ideas described in the textbooks and other resources such as the Internet. After careful consideration of these theories and ideas, they discussed their potential impact and selected one particular idea that best suited the problem selected. Finally, they summarised the idea designed to solve—or at least minimise—the problem.

Step 3: Participants prepared a short presentation to explain the problem and a particular teaching idea designed to solve it, emphasising their reasons for their choice. They presented the problem and teaching idea to peers, instructed them on how to engage in it, and encouraged them to critique their ideas and propose alternative strategies for achieving their purpose. (For possible solutions to Problem 2 above, see Appendix A.)

These three steps required four class meetings because final presentations made by eight groups of students required two class meetings, resulting in participants engaging in seven group problem-solving projects over 30 class meetings over the 2015 academic year.

INSTRUMENT AND MEASURE

Improvements in creative and critical thinking skills were measured using a survey administered at the beginning and end of the research period and containing two five-point Likert-scale questions along with open-ended questions. The questions employed were:

1) Likert-scale questions
   To what extent do you think you can think creatively while interacting with others in English?
   1 (Not at all) – 2 (Not much) – 3 (Average) – 2 (Somewhat) – 5 (Very much)
   To what extent do you think you can think critically while interacting with others in English?
   1 (Not at all) – 2 (Not much) – 3 (Average) – 2 (Somewhat) – 5 (Very much)
2) Open-ended questions
   What did you learn from the teacher-led activity session? (control group)
   What did you learn from the group problem-solving projects? (experimental group)

Improvement in interactional skills was measured using oral fluency scores (Derwing et al., 2007; Segalowitz, 2010) from the KEPT Speaking Test administered to participants at the beginning and end of the 2015 academic year.

Statistical analysis confirmed that the sample met all assumptions for using a *t*-test (Green & Salkind, 2005). No outliers were identified in data on creative, critical, or interactional skills data, and skewness and kurtosis were deemed acceptable. To avoid a Type-1 error due to multiple comparison, the *p* value was adjusted to .016 (i.e., .05 divided by 3 comparisons), such that significance would be achieved for *p* values of less than .16. Three *t*-tests were conducted to compare improvements in interactional skills and creative and critical thinking skills.

Interviews designed to reflect on the teacher's demonstrations and the group problem-solving projects were conducted in the last class meeting. Participants were asked the following:

1. Control group: To what extent and in what respect was the teacher's demonstration of group activities effective?
2. Experimental group: To what extent and in what respect were the group problem-solving projects effective?

RESULTS AND DISCUSSION

QUANTITATIVE RESULTS

The study investigated the effects on L2 creative, critical, and interactional skills of group problem-solving projects in the experimental group compared with teacher-led demonstrations of activities in the control group. Since, as stated above, KEPT oral fluency scores were used as representative of interactional skills, descriptive statistics for story-retelling task scores are presented in Table 2.

A *t*-test was conducted to investigate whether the experimental group's interactional skills significantly improved in comparison with the control group's. Results indicate that the mean of the experimental group *(M* = 4.3, *SD* = .24) was significantly greater than that of the control group (*M* = 3.9, *SD* =.23), $t(23) = 4.5$, $p < .016$. Effect size (Cohen's *d* =. 28) was small (though non-negligible) even based on Takeuchi and Mizumoto's (2014) less restrictive .20 norm for the application of this test in applied linguistics given that other researchers, including Plonsky and Oswald (2014), suggest that Cohen's *d* should equal or exceed .4 for a small effect size.

TABLE 2. Descriptive statistics for KEPT Speaking Test scores

Fluency measure	**Story-retelling Task**			
Groups	***Control group (n=24)***		***Experimental group (n=24)***	
Tests	Pre-test	Post-test	Pre-test	Post-test
M	3.7	3.9	3.8	4.3
SD	.21	.23	.25	.24
Skewness	.63	-.51	.54	-.55
Kurtosis	.65	-.61	.62	.68

Improvements in creative and critical thinking skills were measured through students' responses to two five-point Likert-scale survey questions and reflective interviews conducted with five participants randomly selected from each group on the last day of the research period.

Survey items were piloted with a group of students from the same university and demonstrating similar English proficiency. Rasch analysis was administered on the data, which were checked for uni-dimensionality and reliability (control group: .84; experimental group: .85).

Likewise, *t*-tests were performed on creative and critical thinking scores. Results indicate that the experimental group ($M = 4.1$, $SD = .21$) showed significant gains in creative thinking skills compared to the control group ($M = 3.3$, $SD = .15$), $t(23) = 4.3$, $p < .016$. Moreover, the experimental group ($M = 4.3$, $SD = .18$) showed significant gains in critical thinking skills compared to the control group ($M = 3.2$, $SD = .18$), $t(23) = 4.1$, $p < .016$. Effect size (Cohen's d =. 29 and .31, respectively) was small but non-negligible even based on Takeuchi and Mizumoto's (2014) less restrictive .20 norm for the application of this test in applied linguistics (Tables 3 and 4).

TABLE 3. Changes in creative thinking skills

Skills measured	**Creative Thinking Skills**			
Groups	***Control group (n=24)***		***Experimental group (n=24)***	
Tests	Pre-test	Post-test	Pre-test	Post-test
M	2.8	3.3	2.9	4.1
SD	.17	.15	.18	.21
Skewness	.48	-.44	.55	-.51
Kurtosis	.65	.57	.59	.63

TABLE 4. Changes in critical thinking skills

Skills measured	**Critical Thinking Skills**			
Groups	***Control group (n=24)***		***Experimental group (n=24)***	
Tests	Pre-test	Post-test	Pre-test	Post-test
M	2.8	3.2	2.8	4.3
SD	.15	.18	.17	.18
Skewness	.51	-.45	.54	-.51
Kurtosis	.61	-43	.58	.61

Overall, the experimental group significantly improved in creative, critical, and interactional skills by engaging in group problem-solving projects. It is therefore necessary and pedagogically relevant to investigate why group problem-solving projects were effective along with what other positive effects they may have generated.

QUALITATIVE RESULTS FROM INTERVIEWS

To perform an in-depth analysis of participants' perceptions regarding the results, interviews were conducted with five students randomly selected from each group. Sample responses are shown in Appendix B.

CONTROL GROUP

In the last 50 minutes of class, the teacher introduced three activities described in a particular chapter of the textbooks and instructed students to engage in the activities designed to deepen their understanding of the theories presented in the chapter. On-site observation recorded that the participants seemed actively engaged in their work and enjoyed the group interactions.

However, students' interview feedback revealed that they did not consider all activities equally valuable for L2 learning as some tasks did not suit their intellectual or linguistic level (i.e., too easy or too difficult). Additionally, teacher observations and notes suggest that language use varied across activities, hence repetition of language did not occur, thereby impeding improvements in participants' interactional skills since they were not always involved in active interactions among themselves. Similarly, overly easy or difficult activities did not promote the use of critical or creative thinking skills, which explains why these skills did not improve much. Finally, one reason for the ineffectiveness of activities was the fact that the teacher controlled the session.

EXPERIMENTAL GROUP

In the last 50 minutes of class, the experimental group formed groups of three and engaged in problem-solving projects. The projects included the following afore-mentioned learning behaviours:

1) Approaching the problem from multiple perspectives
2) Critically analysing the information
3) Undertaking the task autonomously
4) Exchanging information and ideas with and learning from their peers as "near-peer role models" (Murphey & Arao, 2001, p. 5)
5) Presenting information and ideas in original and creative ways; and
6) Receiving and producing enriched output (Tomlinson, 2021).

All of these behaviours were reported by the experimental group students. Importantly, the major part of the procedure was undertaken by the students, with the teacher merely guiding their learning behaviours leading to project completion. As students reported (See Appendix B), they took the initiative and interacted intensively by exchanging opinions with group members at all stages, including with the audience in presentations. Unsurprisingly, the experimental group significantly improved their L2 interactional skills. In choosing an L2 learning or teaching problem, generating teaching ideas to solve the problem, and presenting their ideas effectively, they examined options from multiple perspectives using creative and critical thinking. Finally, the project provided opportunities for them to learn from one another about how to think, thus enhancing interactive as well as creative and critical thinking skills.

INTER-GROUP COMPARISON

Feedback from control group participants' interviews suggests that the teacher-led activities were valuable in deepening their understanding of connections between theories and practice, giving them new perspectives on L2 learning and teaching. However, not all learners actively interacted with group members because the activities were too easy and only limited knowledge and language skills were required, making the activities uninteresting or demotivating. Conversely, because for others some activities were too difficult or complex, learners spoke little or resorted to the L1, a problem inherent to teacher-led sessions (Nation, 2013; Onoda, 2019a; Richards, 2016).

Although quantitative data show that the control group showed improvements in L2 creative, critical, and interactional skills, gains were less than those seen in the experimental group. Based on the participants' comments in interviews, these results can be attributed to the following: 1) As activities varied from day to day depending on the focal chapter, repetition of language items and automatization were not adequately facilitated; 2) Content and language were not always familiar to participants; and 3) Some activities were not suited to participants' intellectual levels and thus offered few opportunities for thinking critically or creatively.

In contrast, quantitative results show that the group problem-solving projects the experimental group engaged in had profound effects on their creative, critical thinking, and L2 interactional skills. Based on participants' comments in interviews, they were encouraged to interact with peers and the teacher, including in final presentations. Unlike the control group, they engaged in authentic interactions with specific purposes and functions. They spent ample time discussing what problem they should choose and extrapolating possible solutions from multiple perspectives. This offered opportunities to use the same (or similar) language, critically analyse the information, and exchange ideas with and learn from peers (Murphey & Arao, 2001), amounting to cooperative learning. They also devoted ample time to preparing and presenting information and ideas in creative ways, including creating presentation slides and audio materials designed to elicit feedback from peers. Using the four language skills (Nation, 2013, 2015) deepened their understanding of the content at all stages. Since time constraints were imposed at each stage, project engagement helped facilitate and promote automatization of key language items and deepened their understanding of language learning theories and of the purpose of activities (Gras-Velázquez, 2019). Participants received and produced enriched output (Maley, 2021; Tomlinson, 2021) because their project was genuinely learner-centred. Finally, the students undertook self-regulated learning on their own (Pintrich & Zusho, 2002) by eliciting ideas and feedback.

Students' interview feedback revealed valuable pedagogical benefits yielded by group problem-solving projects. Given that students decided on every aspect of the project in groups, they showed initiative and brought individual strengths into play. The projects allowed them to contribute their strengths to classroom learning and thus enhanced their autonomy. As a result, their responsibility, ownership, and self-efficacy were enhanced (Bandura, 1986). They were encouraged to create a learners' community with peer support provided (where necessary), experience a sense of achievement, enhance their self-efficacy, and prepare for pedagogical problems they may encounter when teaching, thus confirming the predictions of both self-determination theory (Deci & Ryan, 2002) and social cognitive theory (Bandura, 1986).

PEDAGOGICAL IMPLICATIONS

The study suggests several pedagogical approaches to helping learners be creative, critical, and interactive. According to Tomlinson (2021), teachers should:

1) Expose students to creative and critical language use;
2) Set achievable challenges;
3) Adopt a problem-solving approach;
4) Employ open-ended questions rather than closed questions;
5) Provide opportunities to use L2 creatively and critically; and
6) Stimulate meaningful peer-to-peer interactions. (p. 13)

This study showed that group problem-solving projects satisfy all six requirements.

Importantly, teachers should draw on learners' self-efficacy and intrinsic motivation (Bandura, 1986; Deci & Ryan, 2002) by allowing them to take control at every stage, make their own judgements, and allow peers to give positive and informative feedback on their ideas (Onoda, 2015), especially on creative or critical aspects of these ideas (Tomlinson, 2021) because intrinsic motivation and self-efficacy influence self-regulated learning (including creative and critical thinking skills), which in turn improves L2 interactional skills (Onoda, 2012b).

CONCLUSION

One limitation of the study stems from the fact that the researcher-author also acted as instructor for both classes. This configuration potentially weakens the conclusions since the risk of bias cannot be entirely eliminated, as it would be—at least in part—in a true experimental versus control design, with each group taught by instructors working independently from each other and ideally blind to the purpose and design of the study. However, this design was imposed by the institutional context, including the need to preserve intact classes and work within tight schedules for both students and teaching partners.

Despite this unavoidable limitation, this study revealed that group problem-solving projects improved the creative, critical, and L2 interactional skills of third- and fourth-year English majors at a Japanese university. Learner-centred tasks motivated them to actively and continuously engage in discussing problems and solutions based on critical thinking and to present them creatively throughout the project.

Additional pedagogical benefits revealed by the study are: 1) Improvements in intrinsic motivation and self-efficacy; 2) Positive peer feedback and support for community building; 3) Naturally generated authentic interactions; 4) Responsibility for and ownership of the project; and 5) Activation of learners' potential.

If effectively implemented, group problem-solving projects satisfy the innate human needs for autonomy, competence, and relatedness postulated by self-determination theory (Deci & Ryan, 2002). Problem-solving tasks have a profound impact on L2 learning because they help learners achieve linguistic, affective, and social learning goals, all of which are critical to L2 learning. To assist in implementing this approach and making its benefits to as wide a range of learners as possible, future research should focus on first- and second-year non-English majors who are not likely to be as motivated as those in the present study, preferably non-Japanese EFL learners such

as Korean or Chinese university students. The findings should yield robust support to the effects of problem-solving group projects on the development of creative, critical, and interactional L2 skills.

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APPENDIX A

SAMPLE SOLUTIONS TO PEDAGOGICAL INTERVENTION: PROBLEM 2

A group of students presented the following ideas to Problem 2 based on their research at the final stage of the project.

1. The teacher can set guidelines that require students to speak English at all times in class and state that if they violate this requirement, they will receive extra homework. This is effective because the teacher can decide on many aspects of classroom activities, and students usually follow the teacher's directions if they seem sensible. However, there are cases in which some disruptive students will not follow directions, and extra measures may be necessary, for example:

2. First, the teacher should change the seating arrangement of students so that unmotivated students will not sit together and chat in Japanese and disrupt the learning environment. This is effective in minimising negative peer pressure on others to become lazy and facilitating cooperative learning, especially between highly-motivated, proficient students and less motivated, low-proficiency students, which will prevent some students from resorting to the L1 in class.

3. Second, the teacher can give language support by using scaffolding techniques, for example, by providing pre-teaching useful expressions or adjusting the language level and topics in materials and tasks to make them easier. Students tend to speak Japanese when they do not understand the instructions or the materials and cannot express their ideas in English.

APPENDIX B

STUDENT COMMENTS

The following comments were expressed in interviews in a variety of wordings in Japanese and translated by the researcher. S denotes a particular student. For economy of space, only representative comments are shown here.

1. Control Group
   - S1, S2, S4, S5: I enjoyed interacting with others in the group activities, but sometimes the activities were too simple for us to be highly involved and we did not talk much.
   - S4, S5: Some open-ended activities such as opinion-gap activities required creative and critical thinking, which helped us enjoy listening to other people's opinions and experiences.
   - S1, S3, S5: The language we used differed from activity to activity and we did not often recycle the same language.
   - S1, S3: The activities encouraged us to interact with classmates and allowed us to listen to other people's ideas, opinions, and experiences, but some tasks were too easy for us to talk for a long time.
   - S2, S3, S5: The activities enabled us to enjoy them and understand how they related to second language acquisition theories.
   - S3, S5: Some activities were too complicated and difficult, so we did not think critically or creatively or interact with one another much.

2. Experimental Group
   - S6: S7, S8: Group work experiences helped us instigate and maintain our motivation for the task and feel a sense of achievement and confidence.
   - S7, S9, S10: Group work provided opportunities to think about the problem critically from many perspectives based on our individual learning experiences and experts' opinions.
   - S9, S10: The project gave us many opportunities to use English, including reading relevant books, listening to TED-talks, talking to teachers for information and ideas, discussing the problem and possible solutions with one another, and using the same or similar language.
   - S6, S7: We approached the project differently from group to group because we had opportunities to deploy originality and creativity.
   - S8, S9, S10: We were motivated to understand the problem by applying our knowledge and experience and refine our interpretations based on information from other resources.
   - S7, S10: It was great for other students to evaluate our teaching ideas and give suggestions to further improve them or suggest alternative ideas we hadn't thought of. The projects encouraged us to create a learners' community.
   - S6, S10: I was motivated to select a problem and present solutions. After discussing these with my group members and students in other groups, I had a sense of achievement, confidence, and ownership of the project. I felt I was supported by my classmates throughout the project.