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College-level second language courses and creative thinking skills: an ex post facto study

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ABSTRACT

The aim of this quantitative ex post facto research study was to explore whether college learners in the United States who had successfully completed college-level second language course(s) perform better than those who did not complete such a course(s) on the Alternate Uses test in the domains of fluency, flexibility, originality, and elaboration. The sample size consisted of 160 participants, of whom 80 were full-time college learners who successfully completed second language course(s). The MANOVA test suggested that a statistically significant difference existed in the domain of flexibility ($F(1,158) = 5.602; p < 0.05; \text{partial } \eta^2 = 0.034$) but not in the domains of fluency ($F(1,158) = 2.515; p > 0.05; \text{partial } \eta^2 = 0.016$), originality ($F(1,158) = 2.444; p > 0.05; \text{partial } \eta^2 = 0.015$), and elaboration ($F(1,158) = 2.822; p > 0.05; \text{partial } \eta^2 = 0.018$).

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Recent research studies on the link between bilingualism and cognitive skills suggest that bilingualism positively correlates with cognitive skills such as metalinguistic awareness, enhanced metacognitive skills, stronger symbolic representation and abstract reasoning skills, enhanced problem-solving skills, enhanced creative and divergent thinking skills, and greater cognitive flexibility (Adescope, Laving, Thompson, & Ungerleider, 2010). In addition, recent research studies suggest that bilingual learners, as well as advanced second language learners, may perform better academically compared with monolingual learners (Fahim, Bagherkazemi, & Alemi, 2010; Hajilou, Yazdani, & Shokrpour, 2012).

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Previous studies did provide valuable information about the link between bilingualism and cognitive skills, but they have been general and broad in terms because cognitive skills are numerous mental skills that facilitate the learning process, such as critical thinking skills, divergent thinking skills, metalinguistic awareness, metacognitive skills, abstract reasoning skills, problem-solving skills, creative and divergent thinking skills, cognitive flexibility, analytical skills, cognitive tempo, focal attention, automatization, and other cognitive skills (Adescope et al., 2010). Previous research studies that explored the link between bilingualism and cognitive skills did not explore the relationship between bilingualism and one specific cognitive skill. Some recent research studies suggest that second language learners demonstrate strong creative thinking skills (Ghonsooly & Showqi, 2012; Hajilou et al., 2012; Kharkhurin, 2010; Pishghadam, Khodadady, & Zabihi, 2011). Research studies by Ghonsooly and Showqi (2012) and Pishghadam et al. (2011) suggest that creative thinking skills are stronger among second language learners than among monolingual learners. Creative thinking skills are a type of cognitive skill considered to be an important and fuzzy psychological trait because they have not been researched enough by professionals, especially in the language learning domain (Meera & Remya, 2010; Pishghadam et al., 2011). Creative thinking skills, or simply creativity, can be described as the ability to produce novel things and find solutions to everyday problems, and they deserve to be researched in more detail (Pishghadam et al., 2011; Romero, Hyvönen, & Barbera, 2012; Sternberg, 2003).

Previous research studies that explored the link between learning a second language and learners' creative thinking skills did provide useful information and suggestions that learning a second language, as well as bilingualism, positively relates with creative thinking skills (Cross, 2012; Ghonsooly & Showqi, 2012; Hajilou et al., 2012; Kharkhurin, 2010; Luk, 2013; Meera & Remya, 2010; Pishghadam et al., 2011). However, most of these studies were conducted not in the United States but in Australia (Cross, 2012), Hong Kong (Luk, 2013), India (Meera & Remya, 2010), and Iran (Ghonsooly & Showqi, 2012; Hajilou et al., 2012; Pishghadam et al., 2011); and the studies by Ghonsooly and Showqi (2012) and Hajilou et al. (2012) included only female participants. Additional research studies that would be conducted in the United States, with participants of both genders and valid testing tools, are needed in order to see whether the same results would come out as in previous studies (Cross, 2012; Ghonsooly & Showqi, 2012; Hajilou et al., 2012; Kharkhurin, 2010; Luk, 2013; Meera & Remya, 2010; Pishghadam et al., 2011).

The purpose of this quantitative ex post facto study is to determine whether college-level learners of both genders in the United States who successfully completed a college-level second language course(s) perform better in the domains of fluency, flexibility, originality, and elaboration, as measured by the Alternate Uses, than those who did not take a second language course(s) and to extend available research studies on this topic (Ghonsooly & Showqi, 2012; Kharkhurin, 2010; Pishghadam et al., 2011). What is not known, and what the academic community needs to know in order to improve learners' creative thinking skills through a college-level curriculum, is whether college learners who successfully completed second language courses at the college level perform differently in the domains of fluency, flexibility, originality, and elaboration as measured by the Alternate Uses test, than those who did not complete those courses. This particular problem would be studied in the proposed research study.

The two variables to be studied in this research study are (1) the participants' successful completion, or noncompletion, of a college-level second language course(s) as the independent variable and (2) their participants' creative thinking skills scores in the domains of fluency, flexibility, originality, and elaboration, as measured by the Alternate Uses test, as the dependent variable. Based on the power analysis of a multivariate analysis of variance (MANOVA) with the assistance of the G*Power 3.1 software, the minimum sample size of the participants in this

research study should be 80 second language college learners and 80 regular college learners who did not participate in second language courses. All participants would be full-time college-level learners from the United States of America of both genders who are not bilingual and who use only one language as their means of communication. The United States is the geographical location of the research study, and the study would be conducted only within its borders.

2. Theoretical Framework

The investment theory of creativity developed by Robert J. Sternberg (2003, 2006) is concerned with the meaning of creativity and the way creativity develops (Sternberg, 2003). Creativity development, according to the investment theory of creativity, requires the confluence of six resources: intellectual abilities, knowledge, styles of thinking, personality, motivation, and environment (Sternberg, 2003, 2006). Research studies on creativity suggest that creativity is a cognitive skill that can be learned and improved using various cognitive strategies and that it requires constant improvement or else it may completely disappear (Romero et al., 2012; Shaheen 2010; Yu-Sien, 2011). Recent research studies suggest that a positive link could exist between second language learning, as well as bilingualism, and learners' creative thinking skills (Cross, 2012; Ghonsooly & Showqi, 2012; Hajilou et al., 2012; Kharkhurin, 2010; Luk, 2013; Meera & Remya, 2010; Pishghadam et al., 2011). However, existing research studies that explore the relationship between bilingualism and the second language learning process and learners' brain structure, cognitive skills, and creative thinking skills, did not use the investment theory of creativity as their theoretical framework and did not explain whether college-level learners of both genders from the United States who successfully completed college-level second language course(s) perform differently in the domains of fluency, flexibility, originality, and elaboration as measured by the Alternate Uses test, than those who did not take a second language course(s)

3. Research Questions

RQ. What difference, if any, is there between college learners of both genders who have or have not completed a college-level second language course regarding fluency, flexibility, originality and elaboration as measured by the Alternative Uses Test?

3.1. Hypotheses

H0. College learners of both genders in the United States who have and have not taken college-level language course(s) will not score significantly different in terms of fluency, flexibility, originality and elaboration as measured by the Alternate Uses test.

HA. College learners of both genders in the United States who have and have not taken college-level language course(s) will score significantly different in terms of fluency, flexibility, originality and elaboration as measured by the Alternate Uses test.

4. The Second Language Learning Process and Learners' Creativity

After reviewing the most recent research studies whose author intended to investigate the relationship between bilingualism, multilingualism, and exposure to a second language in general on one side and human cognitive skills on the other side, a conclusion can be made that exposure to a second language may have a positive relationship with human cognitive skills.

Further research studies are needed to investigate the reasons why bilinguals, multilinguals, or individuals who were simply exposed to a second language, demonstrate stronger cognitive skills than monolinguals. Is there a possibility that strong cognitive skills were present among bilinguals and multilinguals prior to their exposure to a second language, which automatically contributed to the learning process and helped them to master the second language, or is the acquisition of a second language responsible for the improvement of cognitive skills? Those are some of the questions that have to be answered in the future in order to better understand the relationship between bilingualism, multilingualism, and exposure to a second language in general on one side and cognitive skills on the other side.

By reviewing the most recent research studies, as well as older studies, that investigate this topic, one can notice that exposure to a second language occurs across different settings and that all participants in these studies have their own unique second language learning experience. For example, participants in the previously mentioned research studies by Kang (2012a, 2012b) were exposed to a second language by attending kindergartens where instruction was offered in a second language, whereas participants in the previously mentioned research study by Mårtensson, Eriksson, Bodammer, Lindgren, Johansson, Nyberg, and Lövdén (2012) were adults who were enrolled in the second language classes at the Swedish Armed Forces Intelligence and Security Center. It is important to distinguish simultaneous bilinguals who learn their first language and their second language at the same time, as is the case in the research studies by Kang (2012a, 2012b), from sequential bilinguals, who acquire a second language later in life after they have fully acquired their first language, as is the case in the research study by Mårtensson et al. (2012). Another important feature of the research studies about bilingualism and cognitive skills are the cognitive skills themselves. "Cognitive skills" is broad term that relates to all mental skills that facilitate the learning process. Numerous research studies about bilingualism and cognitive skills have focused on learners' executive functions encompassing many different cognitive skills, not just one particular cognitive skill.

In this section of the literature review, special attention has been paid to previous research studies that aim to answer the research questions in this study and that relate to the hypotheses. The research studies that are reviewed in this section have investigated the relationship between bilingualism and creativity with special attention paid to research studies that investigated the relationship between college learners who attend college-level second language courses and their creative thinking skills.

Creative thinking skills, or simply creativity, and exposure to second languages may positively relate with each other as suggested by the studies of Pishghadam, Khodadady, and Zabihi (2011) and Uteubayeva, Kultanova, and Pastushenko (2012). The research study by Pishghadam et al. (2011) suggests that learners' creativity strongly relates with their achievement in second language learning and that creativity as an important psychological trait has not been investigated in language teaching. The research study by Uteubayeva et al. (2012) provides another suggestion that creativity may serve as a basis for second language learning. Further looking at the most recent research studies about bilingualism and second language learning and how those variables relate with creativity suggests that creativity contributes to the second language learning process. The research studies by Luk (2013) and Schultz (2011) suggest that language creativity may be an essential part of bilingual societies. In her study about bilingualism in Hong Kong, Luk (2013) argues that creativity is an essential part of the local linguistic play that helps local communities to maintain a double-voiced discourse in bilingual communities. Another research study by Schultz (2011) about the role of creativity in bilingual communities suggests that bilinguals rely on linguistic creativity that helps into adopting simple linguistic strategies in order to ease the bilingual process.

Further research studies that investigate the relationship between exposure to second language and creativity suggest that creativity may have a positive impact on the acquisition of second language. It is suggested by recent research studies by Cross (2012), Akinwamide and Adedara (2012), Feuer (2011), Meera and Remya (2010), and Hajilou, Yazdani, and Shokrpour (2012) that creativity can positively impact the second language learning process.

In his study about creativity and second language learning, Cross (2012) suggests that creativity is an important learning factor that assists Australian high school students in learning the Japanese language through Content and Language Integrated Learning (CLIL), whereas Akinwamide and Adedara (2012), in their study about second language learning through cyberlinks, hyperlinks, and Net-surfing, suggest that, along with autonomy, creativity plays a significant role in second language learning. Another similar research study conducted by Meera and Remya (2010) finds creativity along with extensive reading can greatly contribute to the English language learning process among secondary school students from the Kerala district in south-west India. In addition to the suggestions by Meera and Remya (2010), a research study by Feuer (2011) revealed that creativity along with writing projects can significantly contribute to the development of foreign language skills.

The research question and hypotheses in this research study are concerned with the ways that learning second language at the college level relate with learners' creativity. Previously reviewed research studies about bilingualism, second language learning, and exposure to a second language in general provide suggestions that creativity may positively relate with those variables and contribute to the second language learning. However, additional research studies are needed to better understand that relationship and to investigate whether second language learning contributes to development of creativity. Does learning a second language through a college-level second language courses in the United States have a positive relationship with learners' creativity? Recent research studies that investigated this topic have several limitations. They are rare, and they were mostly conducted outside of the United States of America with a limited selection of participants who were in some cases tested using testing tools that are not widely used for testing creativity.

One study by Leikin (2012) about bilingualism's contributions to creativity was conducted among early preschoolers in Israel. The participants in this research study were 23 bilingual children who speak Hebrew and Russian and 14 monolingual children who only speak Hebrew. In the bilingual group, 13 children came from a bilingual kindergarten, and 10 children came from a monolingual kindergarten, whereas all 14 monolingual children came from a monolingual kindergarten. The Picture Multiple Solution task was used to test children's general creativity, and the Creating Equal Number task was used for testing their mathematical creativity. The results provided by Leikin (2012) suggest that early bilingualism and bilingual education positively impact children's mathematical creativity. However, in addition to the research study by Leikin (2012) that suggests that bilingualism among early preschoolers has a positive impact on mathematical creativity, research studies by Kharkhurin (2010) and Ghonsooly et al. (2012) provide insight into how exposure to a second language among college learners relates with creativity.

Kharkhurin (2010) conducted a research study among bilingual college students in the United States of America for the purpose of determining whether bilingualism contributes to verbal and nonverbal creativity. The study by Kharkhurin (2010) included 103 participants who were immigrants from the former Soviet Union who speak Russian and English and who were attending Brooklyn College. Those 103 participants were placed in the bilingual group, while the monolingual group consisted of 47 native participants who only speak English. The results of the study, which were collected using the Abbreviated Torrance Test for Adults, revealed that

bilingual participants demonstrate stronger nonverbal creativity, whereas monolingual participants demonstrate stronger verbal creativity.

The significance of the research studies by Kharkhurin (2010) and Leikin (2012) is that both studies suggest that bilingualism may positively impact creativity. However, they do not provide information on whether second language learning impacts learners' creativity. The same can be said for the previously mentioned research studies by Luk (2013), Schultz (2011), Cross (2012), Akinwamide and Adedara (2012), Feuer (2011), Meera and Remya (2010), and Hajilou, Yazdani, and Shokrpour (2012) that suggested that creativity contributes to second language learning but not whether second language learning contributes to the development of creativity.

The research study by Ghonsooly et al. (2012) is one recent study that investigated the influence of second language learning on learners' creativity. The research study by Ghonsooly et al. (2012) was conducted in Iran with college learners, 60 female advanced English language learners and 60 monolinguals. Unlike the previously mentioned research studies, the testing of the participants' creative thinking skills was done using the Torrance Tests of Creative Thinking (TTCT), a widely used testing tool for measuring creative thinking skills in the domain of fluency, flexibility, originality, and elaboration. The results of the study by Ghonsooly et al. (2012) revealed that the English language learners significantly outperformed monolinguals in all four domains of creativity, suggesting that second language learning at the college level may positively influence learners' creative thinking skills. Further research studies are needed to investigate whether the same results will be obtained among college learners of both genders in the United States of America.

5. Research Methods and Design(s)

The purpose of the proposed quantitative research study with an ex post facto design would be to determine whether college-level learners of both genders from the United States who successfully completed college-level second language course perform differently in the domains of fluency, flexibility, originality, and elaboration, as measured by the Alternate Uses test, than those who did not take second language courses and to extend available research studies on this topic conducted by Ghonsooly and Showqi (2012), Kharkhurin (2010), and Pishghadam et al. (2011). According to Vogt (2007), the difference between the *quantitative* and the *qualitative* research methods is the way data are collected and analyzed. In qualitative research study (Vogt, 2007), data are collected and analyzed in the form of words rather than numbers, which is the case in a quantitative research method. A quantitative research method is the most appropriate method for this type of research study because this research is based on numerical data that would be collected using the Alternate Uses test.

The ex post facto research design was chosen for this study in accordance with the definition of the ex post facto design by Black (1999). According to Black (1999), an ex post facto study is a type of study where researchers have limited control over the independent variable because it is usually a life event or a life experience of the participant that cannot be manipulated, unlike in studies with an experimental design. An ex post facto study aims to determine the cause-and-effect relationship between two or more variables (Gay, Mills, & Airasian, 2011). The independent variable in this research study, which is the successful completion of college-level second language courses among college learners, is an event in the lives of the participants that has already occurred and cannot be changed.

The strength of an ex post facto research design, when used in educational research studies, is that the independent variables that are being explored are life-event variables that occur in real-life situations and natural settings and are not limited to laboratory settings (Black, 1999). Therefore, the findings of studies with an ex post facto design show high external validity and can be generalized.

Experimental and quasi-experimental designs, although very similar to ex post facto design, were not selected for this research study because the completion of a college-level second language learning course(s) is a preexisting variable and cannot not be manipulated, as in the case of studies with an experimental or quasi-experimental design.

Experimental research design, a design where the researcher controls the independent variable that is used to test the impact on experimental and control groups (Black, 1999; Vogt, 2007), has not been used in this study due to the limitations that it was not possible to use random selection and random assignment to control the independent variable. Experimental research designs tend to have strong internal validity when performed in laboratories but expose weaknesses to external validity when performed directly in the field and in the real world (Vogt, 2007); such as is the case with this research study. Therefore, the findings of studies with an experimental design show low external validity and limited generalizability (Vogt, 2007).

In this research study, control over the independent variable was limited because participation in college-level second language courses cannot be directly controlled and manipulated by the researcher. Participation in college-level second language courses is directly controlled by the colleges and universities where the participants are enrolled, as well as the participants' willingness to participate in those courses.

The second reason for not using an experimental research design in this research study is that the "treatment" in the experimental research studies usually only lasts for short periods of time and not more than two hours (Vogt, 2007), whereas the treatment in this particular research study, which is participation in college-level second language courses, is expected to last longer than what is appropriate in an experimental research design. An experimental research design has strong internal validity due to strong controls because of random assignment, but has weak external validity because of the fact that certain variables cannot be manipulated (Vogt, 2007). Weak external validity limits the generalization of the results of the research study, unlike in an ex post facto research design (Vogt, 2007).

A quasi-experimental research design, a design similar to an experimental design except that the researchers do not randomly assign participants to groups but rather use preexisting groups such as classrooms (Vogt, 2007), was also not selected for this research study because of limited access to institutions with classroom settings, lack of random selection of participants, and limited control over the independent variable. In a research study with a quasi-experimental research design, having one group that receives treatment (successful completion of college-level second language courses among college learners) and another that does not would be impossible. A quasi-experimental research design would provide comparison between one group that takes second-language courses and a second group that takes regular classes, which would introduce a whole new set of confounds and concerns. An ex post facto research design is needed in order to compare those who already took and those who did not take college level second language courses.

An ex post facto research design, a research design used in studies where researchers do not have direct control over the independent variable and where the independent variable cannot be manipulated (Black, 1999), was applied to this research study because the independent variable in this research study, which is participation in the college-level second language courses, cannot be directly manipulated by the researcher because it is something that occurs directly in the field.

College learners who decided to participate in the research study would be asked to respond to a survey that would indicate whether they completed one or more second language courses. After responding to the personal survey questionnaire, college learners would complete the Alternate Uses test, which would evaluate their critical thinking skills in the domains of fluency, flexibility, originality, and elaboration.

The research method would include three steps that are necessary to answer the research questions in the proposed research study and to ensure internal and external validity: (a) selection of the participants, (b) data collection, and (c) statistical analysis of the collected data.

The proposed research study would include participants of both genders from diverse cultural, ethnic, and racial backgrounds with different socioeconomic statuses who currently attend an accredited college or university within the territory of the United States. The data for this research study would be collected using a short demographic survey and the Alternate Uses test. The demographic survey would be administered during the selection process in order to determine the participants' personal characteristics and whether they satisfy the requirements for participation in this research study. The demographic survey would provide information about the participant's age, gender, first language, enrollment status (full-time/part-time), potential learning disabilities, citizenship status, date of birth, state of the residence, and whether they attend an accredited college or university in the United States. Their creative thinking skills, including the four domains of fluency, flexibility, originality, and elaboration, would be measured by the internationally recognized and widely used Alternate Uses test. Once the participants' creative thinking skills were already measured using the Alternate Uses test in the domains of fluency, flexibility, originality, and elaboration, the collected creative thinking test scores would be analyzed using a statistical test procedure known as multivariate analysis of variance (MANOVA) because the dependent variable in this research study (scores of creative thinking skills) consists of four domains.

5.1. Population

The population in this research study consisted of full-time undergraduate learners of both genders who attended an accredited college or university in the United States and who had joined SurveyMonkey at the time the research study was conducted and (a) had no learning disabilities that could disrupt their learning process, (b) used English as their first language, and (c) were not bilingual; (d) there were no requirements for race, socioeconomic status, age, and ethnicity. SurveyMonkey is an online survey software and questionnaire tool specialized for online surveys and research studies, with more than 15 million registered users who are available to participate in the research studies announced at SurveyMonkey (SurveyMonkey, 2014).

SurveyMonkey does not provide detailed information about the participants' learning disabilities and bilingualism. Therefore, the key characteristics that describe population members are drawn on the data provided by the National Center for Educational Statistics and the recent survey conducted by U.S. News. According to the estimates of the National Center for Educational Statistics (2014) there were approximately 11.1 million full-time undergraduate students in the United States as of fall 2012 (National Center for Educational Statistics, 2014), of whom about 43% were males and 57% are females with the learning disability estimated report rates of about 44% among males and 56% were females. Data about undergraduate college learners who are bilingual is limited. According to the U.S. News survey conducted in 2014 on nearly 1,800 colleges and universities in the United States, about 5% of graduates in 2013 participated in an English as second language (ESL) program (Haynie, 2015). Based on the data provided by U. S. News, approximately 5% of undergraduate college learners in the United States are expected to use two languages as their means of communication. However, the data about bilingual learners in the US colleges and universities are still limited. The survey conducted by U.S. News may not reflect the general target population.

5.2. Sample

A sample size of 80 second-language college learners and 80 monolingual college learners was selected for this research study with the assistance of the G*Power 3.1 software. The following input parameters were used to determine minimal sample size: minimal effect size $f^2 = 0.25$; significance level $\alpha = 0.05$; power $1-\beta = 0.95$; number of groups = 2; number of predictors (independent variables) = 1; and response variables (dependent variables) = 4.

A random selection method was used to chose the participants of the study. A total of 578 participants responded to the research study, of whom 180 fully qualified to participate in the research study, 90 for the bilingual group and 90 for the monolingual group. After reviewing all the 180 responses, in order to ensure that the participants were qualified to participate in the research study and that the Alternate Uses tests were completed with responses acceptable for evaluation, 80 responses from each group were randomly selected for further evaluation.

The main issue that arose in obtaining the sample that deserve attention was the cost of the research study that affected the sampling process. The research study was based on a minimum sample size of 80 participants for each group. Obtaining a larger sample size was not pursued because of the service cost imposed by SurveyMonkey. The cost of the service provided by the SurveyMonkey would go up with the increase in the sample size.

5.3. Materials/Instruments

The instruments for data collection in this research study would include a demographic survey (Appendix B) and the Alternate Uses test, which is also known as Guilford's Alternative Uses or simply

Alternative Uses. The demographic survey shown in Appendix B would be used to collect personal information from potential participants. The data collected by the demographic survey would provide information about the potential participants' characteristics and whether they qualified to participate in the research study. The demographic survey would determine potential participants' gender, first language, enrollment status (full-time/part-time), potential learning disabilities, citizenship status, date of birth, and state of residence. The validity and reliability of the data collection using the demographic survey would depend on the participants' honesty.

The second instrument that would be used to test participants' creative thinking skills in the domains of fluency, flexibility, originality, and elaboration is the Alternate Uses test with a 9-item assessment, also known as Guilford's Alternative Uses test. This test was designed by the American psychologist Joy Paul Guilford for the purpose of testing divergent thinking skills in the domains of fluency, flexibility, originality, and elaboration (Chermahini, Hickendorff, & Hommel, 2012). The test is a 12-item assessment that can be administered as a 12-item, 9-item, or 6-item assessment. The 9-item assessment test version would be used in this research study. Currently, the Alternate Uses test is a highly used test for testing creative and divergent thinking skills around the world (Chermahini, Hickendorff, & Hommel, 2012; Chermahini & Hommel, 2010; Calzato, Wildenberg, Hommel, 2013; De Bloom, Ritter, Kühnel, Reinders, & Geurts, 2014; Lee & Therriault, 2013; Lewis & Lovatt, 2013; Lewis, Dontcheva, & Gerber, 2011; Opezzo & Schwartz, 2014; Soumala, Toivanen, Maunula, & Taatila, 2013). In addition, the Alternate Uses (1978) test, along with the Torrance Tests of Creative Thinking (TTCT) and the Remote Associates Tests (RAT), has been commonly used as an instrument for testing creative thinking skills, and its reliability is estimated to be 0.86 for a 12-item test for adults, 0.82 for a 9-item test for adults, and 0.75 for a 6-item test for adults (Guilford, Christensen, Merrifield, & Wilson, 1978) compared with the TTCT whose reliability is reported to be 0.80 (Ghonsooly & Showqi, 2012; Hajilou et al., 2012). The Alternate Uses test should not be confused with the TTCT, which was designed by Ellis Paul Torrance and built on Guilford's Alternative Uses for the purpose of testing divergent thinking skills in the domains of fluency, flexibility, originality, and elaboration (Dippo, 2013), even though both tests have been widely used for testing creative thinking skills. The Alternate Uses test is copyrighted by Sheridan Supply Co. and distributed by Mind Garden Inc. in the United States. The test offers up to 12 written assignments where examinees are presented with one particular item and asked to list as many as six possible uses of that particular item.

Figure 1 represents one sample task and possible responses that are common in the Alternate Uses test.

- Name all the uses for a *brick*:
1. *A paperweight*
 2. *A doorstep*
 3. *A mock coffin at a Barbie funeral*
 4. *To throw through a window*
 5. *To use as a weapon*
 6. *To hit my sister on the head with*

Figure I. A sample task from the Alternate Uses test and possible responses. Adopted from Indiana University, R546: Instructional Strategies for Critical Thinking, Collaboration, and Motivation (2014). Copyright 2015 by The Trustees of Indiana University.

6. Results

The results of the descriptive statistical analysis using SPSS suggested that the group that completed a second language course(s) achieved higher mean scores on all four domains than the group that did not complete such a course(s) (see Table 2).

Table 2
Descriptive Statistical Analysis: Alternate Uses Test Scores by Group

Variable	Group	Mean	SD	N
Fluency	L1	19.0625	13.21137	80
	L2	22.4750	13.99365	80
Flexibility	L1	14.0750	9.91709	80
	L2	18.0625	11.34538	80
Originality	L1	0.7375	1.94053	80
	L2	1.5000	3.90715	80
Elaboration	L1	1.6250	4.63988	80
	L2	3.3375	7.84977	80

Note. L1=Participants who did not complete second language course(s).
L2=Participants who did complete second language course(s).

Table 8
MANOVA: Test of Between-Subjects Effects

Variable	Wilks Λ	MS	F	Sig.	Partial η^2	df	Error
Fluency	-	465.806	2.515	0.115	0.016	1	158
Flexibility	-	636.006	5.602	0.019	0.034	1	158
Originality	-	23.256	2.444	0.120	0.015	1	158
Elaboration	-	117.306	2.822	0.095	0.018	1	158
Overall	0.957	-	1.755	0.141	0.043	-	155

Note. MS=Mean Square, Wilks Λ = Wilks' Lambda, Partial η^2 = Partial Eta Squared.
The same results are included in Table 2.

6.1. Results for Research Question

This quantitative research study intended to answer the following research question:

RQ. What difference, if any, is there between college learners of both genders who have or have not completed a college-level second language course regarding fluency, flexibility, originality and elaboration as measured by the Alternative Uses Test?

The answer to the research question was based on the results of the MANOVA univariate test of between-subjects effects as presented in Table 8.

The overall results of the MANOVA in terms of the overall model indicate that college learners of both genders in the United States who took a college-level language course(s) and those who did not take such a course(s) did not score significantly differently in terms of fluency, flexibility, originality, and elaboration as measured by the Alternate Uses test ($F(4,155) = 1.755; p > 0.05; \text{Wilk's } \Lambda = 0.957; \text{partial } \eta^2 = 0.043$).

The following hypothesis were tested in the proposed quantitative research study:

H0. College learners of both genders in the United States who have and have not taken college-level language course(s) will not score significantly different in terms of fluency, flexibility, originality and elaboration as measured by the Alternate Uses test.

Based on the results of the one-way MANOVA multivariate test ($F(4,155) = 1.755; p > 0.05$; Wilk's $\Lambda = 0.957$; partial $\eta^2 = 0.043$), the null hypothesis (H0) was not rejected. College learners of both genders in the United States who took a college-level language course(s) and those who did not, did not score significantly differently in terms of fluency, flexibility, originality, and elaboration as measured by the Alternate Uses test.

HA. College learners of both genders in the United States who have and have not taken college-level language course(s) will score significantly different in terms of fluency, flexibility, originality and elaboration as measured by the Alternate Uses test.

Based on the results of the one-way MANOVA multivariate test ($F(4,155) = 1.755; p > 0.05$; Wilk's $\Lambda = 0.957$; partial $\eta^2 = 0.043$), the alternative hypothesis (HA) was not supported. College learners of both genders in the United States who took college-level language course(s) and those who did not, did not score significantly different in terms of fluency, flexibility, originality and elaboration as measured by the Alternate Uses test.

The answer to the research question is that college learners of both genders in the United States who took college-level language course(s) and those who did not take such a course(s) overall did not score significantly differently in terms of fluency, flexibility, originality, and elaboration as measured by the Alternate Uses test.

The MANOVA did display univariate results on each variable separately. One of the variables, flexibility was found to show a statistically significant difference between the two groups. Each scale is discussed below.

Fluency. A statistically significant difference between scores on the Alternate Uses test was not found in the domain of fluency ($F(1,155) = 2.515; p > 0.05$; partial $\eta^2 = 0.016$). In practical terms, fluency is defined as "the number of ideas and solutions" used in solving a given problem (Ghonsooly & Showqi, 2012, p. 163). It means that participants' ability to generate a number of ideas and solutions to a specific problem is not significantly different between the two groups.

Flexibility. A statistically significant difference between scores on the Alternate Uses test was found in the domain of flexibility ($F(1,155) = 5.602; p < 0.05$; partial $\eta^2 = 0.034$). In practical terms, flexibility is defined as "the number of different categories of relevant responses being used" in solving a given problem (Ghonsooly & Showqi, 2012, p. 163). It means that participants' ability to generate new ideas and solutions to a specific problem is different. College learners who completed college-level second language courses are able to generate more new ideas and solutions to a specific problem than those who did not complete college-level second language courses.

Originality. A statistically significant difference between scores on the Alternate Uses test was not found in the domain of originality ($F(1,158) = 2.444; p > 0.05$; partial $\eta^2 = 0.015$). In practical terms, originality is defined as "the rarity of ideas" used in solving a problem (Ghonsooly & Showqi, 2012, p. 163). It means that participants' ability to generate rare ideas and solutions to a specific problem is not significantly different between the two groups.

Elaboration. A statistically significant difference between scores on the Alternate Uses test was not found in the domain of elaboration ($F(1,158) = 2.822; p > 0.05$; partial $\eta^2 = 0.018$). In practical terms, elaboration is defined as "the number of added ideas, and the ability to develop and elaborate on ideas" when solving a problem (Ghonsooly & Showqi, 2012, p. 163). It means that participants' ability to provide more details and explanations to the solutions to a specific problem is not significantly different between the two groups.

The overall MANOVA results indicate that a statistically significant difference in the performance on the Alternate Uses test in the domains of fluency, flexibility, originality, and elaboration between the two groups of participants does not exist. Based on the results, college learners of both genders from the United States who took college-level second language courses and those who did not, did not significantly differ in creative thinking skills.

7. Recommendations for Future Studies

The present research study did provide a new insight into the relationship between college-level second language courses and creative thinking skills because of the shortcomings in the present research study. However, new research studies with new research designs, a larger sample size, and stronger control over third variables are needed. New research studies would be valuable to see whether different results would be obtained by using different research designs, a larger sample size so the results can be generalized to the general population, and stronger control over third variables that besides learning disabilities and bilingualism may affect the results. Therefore, there are four main recommendations for future studies on the relationship between bilingualism and creative thinking: (a) a quantitative research method with an experimental or quasi-experimental research design, (b) a larger sample size, (c) control over third variables, and (d) a larger sample composed of participants who completed a higher number of college-level second language courses.

Conducting new studies with experimental or quasi-experimental research designs would be beneficial to the academic community because research studies with these research designs could provide a better insight on whether learners' creative thinking skills are stronger after the completion of second language courses and whether there is a possibility that second language courses influence creative thinking skills. The current research quantitative research study was based on an ex post facto research design. Studies that use an ex post facto research design lack, or have limited, control over the independent variable (Black, 1999), and researchers have limited abilities to test preexisting conditions, unlike in studies that use experimental and quasi-experimental research designs. In these studies with an ex post facto design, it was not possible to pretest learners' creative thinking skills prior to their enrollment in college-level second language courses so that the results could be compared with the posttest. A new research study with an experimental or quasi-experimental research design is needed so that learners' creative thinking skills are pretested prior to their enrollment in college-level second language courses and retested after the successful completion of these courses so that the pretest scores can be compared with the posttest scores to determine whether the test scores for creative thinking skills are stronger after the treatment.

The second recommendation for future research studies is larger sample sizes. The participants in the current research study were recruited with the assistance of SurveyMonkey, and the study was based on the minimum sample size because of the cost of services provided by SurveyMonkey. Research studies with a larger sample size are needed so that the sample size can closely relate with the general population, which will improve the reliability of the results and allow greater generalization of the results.

The third recommendation for future studies on this topic is to impose greater control over the participants' socioeconomic status as the third variable that could influence the dependent variables. Bilingualism and learning disabilities are third variables that were supposed to be controlled in this research study. However, socioeconomic status, which was not controlled in this research study, is another factor that could influence academic performance (Farias, 2014; Puddey & Mercer, 2014; Shawareb, 2011; Sidiropoulou-Dimakakou, Argyropoulou, Drosos, & Terzaki, 2012). Therefore, it is recommended for future research studies on creative thinking skills and college-level second language

courses to take the socioeconomic status of the participants into consideration in order to ensure that the influence of socioeconomic status on creative thinking skills as a dependent variable is minimal.

And the fourth recommendation for future research studies is to include a higher number of college learners who completed a higher number of college-level second language courses in order to determine whether the number of college-level second language courses relates with their performance on the Alternate Uses test. Majority of the participants in this research study who completed college-level second language courses took one or two courses. Five participants completed four courses, and one participant completed five courses. The participants who completed four college-level second language courses achieved higher test scores than those who completed fewer courses. Further research studies are needed to determine whether the number of college-level second language courses relates with the learners' creative thinking skills.

8. Conclusion

The problem addressed in this quantitative ex post facto research study was the need to understand the link between the successful completion of second language college courses by college learners of both genders in the United States and creative thinking skills in the domains of fluency, flexibility, originality, and elaboration as measured by the Alternate Uses test. This quantitative ex post facto study has roots in other research studies that explored the relationship between bilingualism and cognitive skills. The literature review revealed numerous studies that suggest that bilingualism and mastery of second languages are positively correlated with cognitive skills. Recent research studies that explored the relationship between exposure to second languages among college learners and creative thinking skills suggest that those who successfully completed a college-level second language course(s) demonstrated stronger creative thinking skills than those who did not complete such a course(s) (Ghonsooly & Showqi, 2012; Hajilou et al., 2012; Pishghadam et al., 2011). Further studies on this topic are necessary because previous research studies, which were conducted outside the United States (Ghonsooly & Showqi, 2012; Hajilou et al., 2012; Pishghadam et al., 2011) had limited selections of the participants. They included only female participants (Ghonsooly & Showqi, 2012; Hajilou et al., 2012) or immigrant students who were bilingual prior to their college enrollment (Kharkhurin, 2010) and employed testing tools that are not widely used to test creative thinking skills (Pishghadam et al., 2011).

The purpose of this quantitative ex post facto study was to determine whether college-level learners of both genders from the United States who successfully completed a college-level second language course(s) performed differently from college learners who did not take a second language course(s) in the domains of fluency, flexibility, originality, and elaboration as measured by the Alternate Uses test. It also sought to add to existing research studies on this topic (Ghonsooly & Showqi, 2012; Kharkhurin, 2010; Pishghadam et al., 2011).

A total of 160 participants took part in this quantitative ex post facto research study. A sample size of 80 second-language college learners and 80 monolingual college learners was selected with the assistance of the G*Power 3.1 software. The following input parameters were used to determine the minimal sample size: minimal effect size $f^2 = 0.25$; significance level $\alpha = 0.05$; power $1 - \beta = 0.95$; number of groups = 2; number of predictors (independent variables) = 1; and response variables (dependent variables) = 4. The 9-item version of the Alternate Uses test, also known as Guilford's Alternative Uses test and the Alternative Uses test (see Appendix C), was used to test participants' creative thinking skills in the domains of fluency, flexibility, originality, and elaboration. The test was designed by the American psychologist Joy Paul Guilford to test divergent thinking skills in the domains of fluency, flexibility, originality, and elaboration (Chermahini, Hickendorff, & Hommel, 2012).

The data collected from both groups were entered into a computer program, SPSS, to determine the statistical differences between their scores on the Alternate Uses test in the domains of fluency, flexibility, originality, and elaboration. The presence of a statistically significant difference between scores on the Alternate Uses test was determined by comparing the means of the two groups (Coladarci, Cobb, Minium, & Clarke, 2011) using a multivariate analysis of variance (MANOVA), which also compared the performances of the two groups in all the four domains of creative thinking.

The results of the descriptive statistical analysis suggested the group that completed a second language course(s) achieved higher means in all the four domains of creativity: fluency, flexibility, originality, and elaboration. By comparison, the other group achieved lower means in all the four domains. The results of the MANOVA test suggest that there is no significant difference between the groups' performances. The same results, which were used to answer the research questions and the test hypotheses, suggested statistically strong differences between the mean scores exist solely in the domain of flexibility and that suggested further that statistically significant differences between the mean scores do not exist in the domains of fluency, originality, and elaboration.

It is important for researchers to understand that majority of the participants in the group that completed second language courses were college students who took fewer than four second language courses. This group consists of 80 participants, of whom 46 (57.5%) completed one second language course, 24 (30%) completed two courses, 4 (5%) completed three courses, 5 (6.25%) completed four courses, and 1 (1.25%) completed five courses. A new research study has been recommended with more participants in both groups. Special attention would be on the selection of participants who completed second language courses so that the number of participants who completed one or two second language courses is equal or approximately equal to the number of those who completed three, four, five, or more.

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Appendixes

Appendix A: Informed Consent Form
Informed Consent Form

The informed consent form is for college learners from the United States who, of their own free will, decided to participate in a proposed research study about creative thinking skills.

My name is Sandro Sehic, and I am currently enrolled in a doctoral program at Northcentral University in Prescott Valley, Arizona, specializing in curriculum and teaching. I currently reside in Utica, New York. Before I invite you to participate in the research study, I would like you to carefully read and sign the following informed consent form, which will provide you with information about the research study, its purpose and significance, participants contribution to the study, participants rights, and confidentiality.

The research study in which you are invited to participate is a part of a proposed doctoral dissertation at Northcentral University in Prescott Valley, Arizona.

The purpose of the research study is to investigate whether college learners from the United States who have successfully completed a college-level second language course(s) perform differently on the Alternate Uses test in the domains of fluency, flexibility, originality, and elaboration than college-learners who did not complete a college-level second language course(s).

The research study is significant because it will provide the academic community in the United States, as well as the rest of the world, with information on whether knowledge of a second language(s) acquired through a college-level second language course(s) relates with creative thinking skills.

As a participant in the research study, you will greatly contribute by completing the test that will be administered. Without your participation it would be impossible to carry out this research study.

It is important for you as a participant in this research study to understand your rights. Your participation is of your own free will. You will not receive any reward or compensation for participating, nor will you be denied any rewards or compensation for choosing not to participate.

All personal information you provide in this research study will be strictly confidential and only shared between the participant, the researcher, and the officials at the Northcentral University in Prescott Valley, Arizona. It means that your personal information will be confidential and will not be revealed.

In this research study, we ask you to complete two instruments: (a) demographic survey and (b) the Alternate Uses test. It is expected that you will provide honest answers or with the best of your knowledge.

(a) The demographic survey is a survey that all participants are required to take. The survey will provide information about your personal characteristics.

(b) The Alternate Uses test is currently widely used in testing creative thinking skills, and it consists of 9 assignments. In each assignment, you will receive a word that represents an item. You will be asked to list up to six ways to use that particular item. You will have up to 90

minutes to complete the test. If you decide for any reason to withdraw from the research study, you may do so.

The objective of the research study is to test 160 participants. Your test scores will be entered into an SPSS computer system for data analysis along with the test scores of the rest of the participants and will not be used on an individual basis.

If you have any further questions about the research study, you may contact Sandro Sehic at ssehic@roadrunner.com and Dr. Kelly Chappell at kchapell@ncu.edu.

By selecting the option "I have read the Informed Consent Form and I agree to participate in the research study," you are acknowledging that you understand the purpose of the research study and your rights, and agree to participate in the research study.

I have read the Informed Consent Form and I agree to participate in the research study.

I did not read the Informed Consent Form. I do not wish to participate in the research study.

Section III

11. Have you ever taken and completed a second language course(s) at your college or university?

1. Yes

1. No

12. How many second-language did you complete at your college or university?

Appendix C: Alternate Uses test

Part I

List as many as six possible uses for each of the following objects:

1. **SHOE** (used as footwear)

- a. _____
- b. _____
- c. _____
- d. _____
- e. _____
- f. _____

2. **BUTTON** (used to fasten things)

- a. _____
- b. _____
- c. _____
- d. _____
- e. _____
- f. _____