

Creativity and Interdisciplinarity in Students' Writings: Evidence of Infusion from Paragraph Writing Tasks

Wondifraw Mihret

Department of English Language and Literature, College of Social Sciences and Humanities, Debre Markos University, Debre Markos, Ethiopia,
wondemihret2009@gmail.com or wondifraw_miihret@dmu.edu.et

Abstract: *The purpose of this study was to analyze the extent to which creativity and interdisciplinary are infused in the writings of first-year software engineering students in higher education. A corpus analysis of student texts on interdisciplinary and crosscutting issues was conducted to compare their creativity and general paragraph-writing performance. Sixty-two paragraphs written by 31 students were selected from the writings of 60 students (120 paragraphs) through systematic random sampling. Experienced EFL instructors using creative thinking facets evaluated students' creativity: fluency, flexibility, originality, and elaboration while their general paragraph-writing performance was assessed using direct writing assessment rubrics. Data were analyzed using mean, paired-sample t-test, and linear regression techniques. The findings showed that significant differences were observed between students' creative thinking and their writing performance on crosscutting versus interdisciplinary issues. The effect of creativity on performance was more substantial when students wrote on interdisciplinary topics, which allowed them to integrate discipline-specific knowledge. By analyzing paragraphs written on two different issues, this study underscores the natural interdependence of creativity and interdisciplinarity in writing classes. It further suggests that writing courses in higher education should incorporate a tripartite infusion of creativity, interdisciplinarity, and writing pedagogy.*

Keywords: *creativity, creative thinking, interdisciplinary writing, infusion*

Introduction

Creativity is defined as the production of new and useful ideas that are related to certain products, services, processes, and procedures (Amabile, 1983, 1996). It is an increasingly pertinent competence for the development of knowledge society in the 21st century (Ferrari, Cachia, and Punie, 2009). Theories of creativity shape the contemporary education system and reforms which demand changing from

informative and authentic modes of delivery to transformative approaches that often nurture inventiveness (Hylan and Wong, 2013). Innovations in English language education, for example, necessitate creativity via provoking thinking and idea generation which are directly reflected in language use (Langlotz, 2016). Language and creativity interplay to affect students' learning as linguistic creativity is an exceptional property of everyone (Carter, 2004). Using English as the main language of communication in the classroom naturally provide students opportunities for evolutionary little 'c' creativity which Craft (2001) discusses as it is everyday creativity and is more relevant to the field of education. It also worth systematically planning for little 'c' creativity in lessons at appropriate moments like brainstorming what learners know about a topic or asking for their personal response (Read, 2015). Research findings also show that the biggest obstacle to creativity is the language barrier (Halim, 2009). The interdependence of creativity and language has been, however, given little emphasis, even language teachers themselves do not seem to consider their subject as essentially characterized by creativity (Giauque, 1985). This is congruent with some studies that confirm as teachers and people in general associate creativity with the arts, not subjects like languages (Newton & Newton, 2010). However, linguistic creativity in particular is so much part of learning and using a language that we tend to take it for granted (Maley and Peachey, 2015). Jones (2016b) magnifies the role of language in creative thinking development explaining as the tension between what we want to do and what language will allow us to do is the most important element, nor does creative persons or creative products.

In the various paradigms of teaching English, there exist diverse foci to the development of the language system and communicative skills. Many teachers around the world, for example, think about and plan their lessons to work with the language system by presenting and practicing vocabulary, grammar and pronunciation, and developing speaking, writing, listening and reading has been their vital focus (Fehér, 2015). Though the emphasis given to these aspects of language instruction vary, the framework of thinking which governs these all has become the point of attention. The potential in every language class for students and teachers to cultivate their creativity is so high as language learners need opportunities to experiment with ideas and language freely and spontaneously (Maley and Peachey, 2015). Much L2 research has indicated that learners' language use in oral communication tasks is associated with creativity (McDonough et al., 2015). Writing something which matters to those involved could be considered a creative act as little c' creativity is inherent in language

itself and extends right across all age ranges, all levels of competence, all teaching contexts and all geographical regions (Maley and Peachey, 2015).

Creativity arises from learners' engagement in an activity which is an important element of English language learning that requires integrating creative activities whose outcomes are extended to personal growth and the development of culture and society (Papalazarou, 2015). The recent development in language teaching integrally addresses equivalently infusing discipline related contents with language instruction so that creative and interdisciplinary competencies can be attained. Interdisciplinarity is an integrative approach of knowledge of different disciplines contrasted and changed by integration (Elisabeth et al, 2009). Creative pedagogies centripetally derive infusing disciplinary contents with language in the overall process of learning for the development of multiple competencies (Chen & Wang, 2016; Richards, 2013). Thus, the outcome has dual roles as the language teaching practice circumscribes the discipline, and both are in turn shaped by creative pedagogies as the nucleus for language teaching (Chen & Wang, 2016). Making connections and seeing relationships between things generates ideas and underpins creative thinking (Hearn, 2003). Interdisciplinary thinking accounts the knowledge of disciplines, interdisciplinary higher-order cognitive skills, and communication skills. It is often carried out by combining a content-based course and a skills-based course into curriculum, wherein students can develop their content knowledge and academic skills at the same time (Campbell, 2012).

The curricula of Ethiopian higher education are not geared toward the development of employability higher-order critical and creative thinking skills due to the accustomed traditional practices valuing multidisciplinary standalone modes of delivery which disregard the contribution of interdisciplinary competencies (MoE, 2018). Jones (2012) reveals that creativity which is commonly infused in 80% of arts and communication related course works is inculcated only in 3% of biology majors and about 13% of engineers and business students. In the same token, English language oral and written communication related competencies which pivotally ignite creativity in academic and occupational settings have been given minimal emphasis and are overlooked in the curricula of different disciplines in Ethiopian universities (MoE, 2018).

Allison (2004) states the extant perception which revealed that skepticism on creativity for academic writing is merely related to literary creative writing alike the way he thought in his earlier experience. He claims as creativity has been given little attention

in academic writing since the EAP discourse community is more concerned to show conventions than to be creative pedagogical controversies over academic and other forms of writing. He justified as the focus need to be on renewing attention for creativity in the writing pedagogy as creativity is more of an integrated view of writing engagement with content and dialogue in rhetorical situation. Otto (1998) related creative thinking and idea generation as instances to understand the connection between creativity and language learning success. He particularly argues as processes of creating and composing are similar as creative thinking in both cases involves preparation, incubation, illumination, and verification or revision. Most indications of this position in the data representing creativity are important in terms of ‘content’ and thinking. Good academic writing, in this view, is tailored to its content and purpose through the adoption of existing conventions.

Tin (2011a) and Pennington (2015) confirm that the redundant and mere focus on genre-based functional communicative components of language education in the learners’ comfort zone let them just live in their own proximal zones other than encountering creative exposures. This is ‘If you always do what you have always done, you will get what you have always got! This has a tendency of being globally, however, replaced by creative practices which enhance learners’ imagination by engaging them with creative and critical thinking tasks (Tin, 2016). Driving to the construction of form, meaning and use unknown to the learners by designing and implementing output driven tasks has been proposed by cognitive psychologists and Vygotskian socio-cultural constructive viewers (Tin, 2016).

The instruction of productive interdependent competencies for instance demands creative ways of learning to accomplish English language tasks. Hence, contemporary literature controversially argues that the implementation of communicative language teaching by itself can enhance students’ creativity and communication competencies. On the other hand, the separate English language teaching failed to attribute to the development of employability competencies (Chen & Wang, 2016). They studied the effect of creativity on students writing task performances and the circumlocution of writing with the teaching of entrepreneurship course other than integrating some concepts of entrepreneurship in writing lessons. Allison (2004) also revealed the effect of creativity on students’ academic writing performance in EAP context using questionnaire and interview. Crossley et al (2016) studied that creativity has significant effect on students’ idea generation. Ghonsooly and Shoqi (2012) investigated how foreign language learning significantly influences individuals’ divergent thinking abilities. Pishghadam et al (2012) also confirmed the existence of

strong relationship between teachers' creativity and their success in classroom. Their finding revealed that a series of creativity dimensions can significantly predict teacher success.

These studies generally overlooked how interdisciplinary competency development is a natural phenomenon that the teaching of writing should impart. As far as my investigation is concerned, exploring the interdependence between creativity, learning writing and interdisciplinary integration in the process of teaching writing has been disregarded. The writing pedagogy which praises creative and interdisciplinary approaches is contemporarily proliferated to alter utilitarian and conventional product and person multidisciplinary approaches of teaching writing by engaging students with discipline grounded creative thinking tasks (Hyland and Wong, 2013). This study was thus, aimed to analyze the natural tendency that may be recognized in the students' independent written texts. It was intended to discover the differences students had in creativity and performance when they are exposed to write on crosscutting and interdisciplinary writing issues. The extent to which creativity and interdisciplinarity are normally infused in the writings of software engineering students to enhance or deter general writing performance or not was the point of analysis. This was conducted in classroom writing settings where the teaching of writing and major courses lacks this intertwinement. The study was generally envisioned to draw implications to the likely writing pedagogy that could enhance multiple competencies across the curriculum just by using the analysis of students' corpus data written on discipline related and general crosscutting issues.

Methods

An analytical scoring method was used to analyze the data collected from the corpus of 31 students' writings selected from first year software engineering students using systematic random technique. As basic writing skills and language programming courses were offered to them, students were asked to do two untimed paragraph writing tasks in a specific date. One of the tasks was to explore if students could be better in creative thinking and writing performance given a general crosscutting topic, the comparison and contrast writing on the role of men/women in traditional and modern societies. The other writing task was based on discipline related issue courses they took in the previous semester(s) which require them to compare and contrast the human language and programming language. Haynes (1996) suggests comparison and contrast of various discipline issues are better used as an introduction to interdisciplinary writing tasks which invite them to examine interdisciplinary writing

critically. This task was aimed to investigate the extent of students creativity and accompanying writing performance which might be naturally infused in the students writing engagements.

About 120 paragraphs were written in the classroom out of which only 62 were used for analysis. The creative thinking performance of students were evaluated using fluency, originality, flexibility and elaboration indicators of creativity using a rubrics adapted from Crossley et al, (2016). This is in line with what (Read, 2015) suggested as two of generic principles of developing more creativity by using association and divergent thinking. Their writing performance was also analyzed using a general direct writing assessment rubric adapted from Naghadeh (2013) so that the scoring scheme focused on content (idea), organization, language and mechanics.

Two raters were given training on how to score creative thinking and performance using the rubrics designed. After a short training was given to two EFL experienced instructors who were at PhD study, about five students' paragraphs which were not selected as a sample in this study were given to rate. The consistency of the rating was checked through inter-rater reliability which was calculated to be 0.98 for overall creativity, and 0.956 for total performance which is highly reliable.

Table 1. Inter-rater reliability of students' paragraph writing creativity and performance

| Indicators of creativity and performance | Pearson correlation |
|--|---------------------|
| Fluency | 0.627 |
| Flexibility | 0.756 |
| Originality | 0.863 |
| Elaboration | 0.839 |
| Content | 0.963 |
| Organization | 0.965 |
| Language | 0.652 |
| Mechanics | 0.951 |
| Total creativity | 0.980 |
| Total performance | 0.956 |

The data collected from such corpus was analyzed using mean, paired sample t-test and linear regression analysis. The description of students' creativity and performance was primarily analyzed through mean and standard deviation. A paired t-test analysis was done to show how students performed differently when they were given to write on interdisciplinary or crosscutting issues. The extension of the analysis to investigate the causal relationship between creativity and paragraph writing performance when the students' on-spot writing engagements vary from crosscutting to interdisciplinary issues was conducted using linear regression analysis. To supplement these data, all students were finally asked to express their perception about the two writing tasks.

Results and Discussion

Creativity and performance in interdisciplinary writing

Creativity is often assessed using indicators of divergent thinking that address the extent students generate many and varied ideas that have original qualities as compared to their counterparts who are engaged in the same task and their ideas need to be well elaborated as well. According to Table 2, students are more creative when the task they are engaged is on interdisciplinary issues as compared to writing task engagement on familiar crosscutting issues. Comparatively, students engaged in writing tasks whose issues are interdisciplinary were able to generate as many ideas which have varied issues. These ideas are well elaborated and more inventive. In

general, students' writings do not meet the criterion set in relation to originality, flexibility and elaboration, but they qualify the criteria of influences in writing paragraphs on an interdisciplinary issue. The result is less in that they failed to meet the criteria in all aspects of divergent thinking. The extent of creative orientation and writing performance was higher for interdisciplinary writing engagements.

Table 2. Students' creativity in writing on interdisciplinary and crosscutting issues

| Creative thinking | Creative thinking in writing on an Interdisciplinary issue | | | | Creative thinking in writing on a crosscutting issue | | | | |
|--------------------------|--|---------|---------|---------|--|---------|---------|--------|----------------|
| | N | Minimum | Maximum | Mean | Std. Deviation | Minimum | Maximum | Mean | Std. Deviation |
| Fluency | 31 | 1.00 | 5.00 | 3.1290 | 1.0325 | 1.00 | 4.00 | 2.1290 | .99973 |
| Flexibility | 31 | 1.00 | 4.50 | 2.4839 | 1.0366 | 1.00 | 3.00 | 1.4516 | .68745 |
| Originality | 31 | 1.00 | 4.00 | 2.0968 | .95236 | 1.00 | 2.00 | 1.2258 | .38381 |
| Elaboration | 31 | 1.00 | 5.00 | 2.9032 | 1.1061 | 1.00 | 4.00 | 1.9194 | .97551 |
| Mean creativity | 31 | 4.00 | 18.50 | 10.6129 | 3.95540 | 4.00 | 12.50 | 6.7258 | 2.89205 |
| Mean writing performance | 31 | 5.50 | 20.00 | 11.3226 | 3.85259 | 4.00 | 15.50 | 8.1774 | 3.43402 |

In their overall creativity, students were more creative thinkers when they were engaged in interdisciplinary writing issues ($N=31$, *mean value*, 10.6) as compared to engagements in common crosscutting issues ($N=31$, *mean value*, 6.7). Their writing performance was also higher ($N=31$, *mean value*, 11.3) than their writing practices on commonly known issues ($N=31$, *mean value*, 11.3). Students were also asked to explain their interest and confident engagement towards crosscutting or interdisciplinary issues. Out of 60 students, 14 replied as they were more interested and wrote paragraphs on a crosscutting issue related to gender related stereotypes with confidence. The rest of them, except 4, explained as they were happy to write on an interdisciplinary issue which requires them to compare the nature of human language with programming language. Thus, it can be implied as student's creativity and performance in writing has some natural orientation as far as this single writing engagement is concerned.

The comparison of students’ texts written on interdisciplinary and crosscutting issues was analyzed using paired samples t-test. The results hence revealed that the creativity and performance of students are significantly different when they write on interdisciplinary and crosscutting issues. This depicts as interdisciplinary writing has more significant effect on creativity and performance than writing on commonly known topics.

Table 3. Comparison of writings on interdisciplinary and crosscutting issues

| | | Paired Samples Test | | | | t | df | Sig. (2-tailed) | |
|--------|-------------|---------------------|----------------|------------|---|---------|-------|-----------------|------|
| | | Paired Differences | | | | | | | |
| | | Mean | Std. Deviation | Std. Error | 99% Confidence Interval of the Difference | | | | |
| | | | | | Lower | Upper | | | |
| Pair 1 | Creativity | 3.88710 | 3.35835 | .60318 | 2.22836 | 5.54583 | 6.444 | 30 | .000 |
| Pair 2 | Performance | 3.14516 | 2.51062 | .45092 | 1.90513 | 4.38519 | 6.975 | 30 | .000 |

Interdependent effect of creativity, interdisciplinary, and writing performance

The type of issues selected for students to write on affects their creative thinking and performance on the production of well-organized texts. The results presented so far showed students who were engaged in writing a paragraph on an interdisciplinary issue, which relate human language with programming language, achieve better in creative thinking and general writing performance. To make sure if this single natural instance of writing can imply the level of effect of writing on interdisciplinary and common issues on students’ performance, a linear regression model was employed. The model imply that predictors of creativity explain writing performance in more than 84 % (crosscutting issue) and 90% interdisciplinary issue.

Table 4. The interdependence between creativity, interdisciplinary and writing performance

| Model | | Coefficients ^{ab} | | | | |
|-------------------|-------------|-----------------------------|------------|---------------------------|--------|---------|
| | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
| | | B | Std. Error | Beta | | |
| Interdisciplinary | (Constant) | 2.149 | 0.762 | | 2.819 | 0.009 |
| | fluency | -0.113 | 0.586 | -0.03 | -0.192 | 0.849 |
| | flexibility | 3.607 | 0.734 | 0.971 | 4.915 | 0.000* |
| | originality | 1.293 | 0.586 | 0.32 | 2.206 | 0.036** |
| | elaboration | 1.129 | 0.47 | 0.324 | 2.402 | 0.024** |
| Crosscutting | (Constant) | 0.114 | 1.029 | | 0.111 | 0.913 |
| | Fluency | 1.368 | 0.612 | 0.398 | 2.236 | 0.034** |
| | Flexibility | -0.214 | 1.189 | -0.043 | -0.18 | 0.859 |
| | Originality | 2.591 | 1.772 | 0.29 | 1.462 | 0.156 |
| | Elaboration | 1.191 | 0.574 | 0.338 | 2.074 | 0.048** |

a. Dependent Variable: writing performance on interdisciplinary issue

b. Dependent variable: writing performance on crosscutting

* *P* value less than 1%, and ** *p* value less than 5% level of significance

The study specifically analyzed the extent of effect on each attribute of creativity when students' writing engagement varies from interdisciplinary to crosscutting issues. Accordingly, except fluency, all attributes of creativity significantly affect the writing performance of students when they are engaged in an interdisciplinary writing issue. This result for fluency (r , 0.034) and elaboration (r , 0.048) is statistically significant for students who were engaged in writing on a crosscutting issue that they are exposed in various academic and life experiences while flexibility and originality have insignificant effects. This at spot analysis generally implies that the interdisciplinarity of topics that students are required to write about determine their creativity and performance as ideas are engines for being creative and productive.

Discussion

The findings from the analysis revealed that creativity significantly affects writing performance in both exposures of writing on interdisciplinary and crosscutting issues that students are familiar due to academic and non-academic experiences. Sannomiya and Yosuke's (2016) finding is also consistent with the finding of this study as idea generation has significant effect on students creativity. Some scholars urged English-as-a-foreign-language (EFL) writing teachers to see writing as a creative enterprise and move beyond the conventional form-focused or genre-based instruction (Dai, 2010, 2012, as cited in Chen and Wang, 2016).

Flexibility, originality and elaboration have significant effects on students writing performance who were engaged in interdisciplinary writing issues. The effect of these divergent thinking aspects of flexibility and originality is insignificant whereas students' writings' fluency and elaboration have significant effects on condition that students were given tasks to write on general crosscutting issues. This is consistent with Zabihi et al. (2013) who claim that there is a negative correlation between creative originality and the writing performance. Ghonsooly and Shoqi (2012) investigated the effect of foreign language learning on individuals' divergent thinking abilities. Otto (1998) attempted to understand the relationship between creativity and language learning success. Creativity, based on many years of classroom experience, practical ideas and activities is pertinent for immediate classroom use (Read, 2015). But the potential in every language class and the tasks employed for such purpose, in all skills and types of activities, for students and teachers to cultivate their creativity has been proved remarkable (Maley& Peachey, 2015).

Studies conducted in Hungary (Albert, 2006; Otto, 1998 and Iran (Ghonsooly and Showqi, 2012) discuss how learners' creativity is linked to the general language proficiency of English language learners. Looking into the issue from a perspective that confirms if English language learning would have a positive effect on learners' creativity was suggested by them. These all imply as predictors of creativity that are often assessed from creative thinking perspective fluency, flexibility, originality and elaboration significantly attribute to general writing performance.

According to the analysis and evaluation of students' texts written on interdisciplinary and crosscutting issues, the paragraphs are better when students are engaged in interdisciplinary writing tasks. The effect of such attributes of divergent thinking is slightly higher than the learners' engagement in commonly known crosscutting issues.

This finding has congruency with what Chen and Wang (2016) posited in their project. They have shown that interdisciplinary learning in academic writing classes is practicable and invaluable to nurture multiple competencies like English writing skills and entrepreneurship. Software engineering students who wrote paragraphs on the two issues were asked to express their reflective interests towards the two writing tasks and about 70% were interested in writing on the given interdisciplinary issue. Chen and Wang's (2016) finding consistently proved that interdisciplinary writing engagements helped students explore their interests and encouraged them to pursue their goals beyond the classroom. The suggestion that Becker and Roos (2016) forwarded in their study supports this idea in that language classes offering diverse activities arouse students' interest and enable them to manipulate their creative and imaginative thinking.

The findings generally confirm that creativity, interdisciplinarity and general writing performance are interrelated. The extent the learners could improve their creativity with a mere multidisciplinary teaching where various courses are offered independently with the assumption students are cognitively intra-active to exploit their knowledge is not as such effective. István (1998) suggests that creativity and success in language learning and discipline related performance are highly interconnected as showed on a creativity test. Haynes (1996) also recommend giving more careful attention to the nature of interdisciplinarity and how it can be taught seems crucial if educators want to foster their students' academic success as well as their self-conscious awareness of the codes, conventions, assumptions and practices which regulate the interdisciplinary community.

Conclusions

English language teaching has been wrongly conceived as it has little contribution to make learners creative and innovative. Though authentic and communicative practices have their own typical features to guide learners creative thinking, a separate entertainment of utilitarian language philosophy takes the students competencies nowhere. The findings in this study which confirmed the significant role of intertwining creativity, interdisciplinarity and English language writing skills imply how far well designed and curriculum based interventions could attribute to the development of multiple employability competencies in ELT at higher education. Taking interdisciplinary issues as 'fields' and creativity pedagogies as an 'engine' and the teaching of writing and its philosophies as a 'centripetal' force to shape all them is suggested to solve problems related to the contemporary creative competencies. It is

hence concluded that successes and failures experienced in the teaching of writing are associated with the implementation of standalone multidisciplinary approaches which desire the attainment of goals through independent and multiple efforts. Circumlocating interdisciplinarity and creativity with wider English language practices would bring about holistic, personal and social transformation. Identifying academically and occupationally pertinent issues in every field of study and designing writing courses across the curricula of various fields using creative pedagogies should be prioritized.

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