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Exploring the *8Ps* of Creativity in CALL Materials: The Case of Duolingo, Busuu, and HelloTalk

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Abstract

Given the due attention to creativity is a key factor in effective second or foreign language (L2) teaching and learning, especially when technology plays a role. Therefore, the purpose of this study was to investigate the distribution of creativity within Duolingo, Busuu, and HelloTalk—three of the most widely used language learning applications. Following a basic content analysis, we collected the data for analysis based on the activities, tasks, and practices that the three applications provided at the elementary level. We followed a descriptive and deductive design to conduct the basic content analysis to analyze the data. The findings revealed that Duolingo's attractive environment enhances learner engagement and encourages the selection of effective thinking processes, resulting in more tangible and creative outcomes. Moreover, Duolingo fosters creativity in learners by creating an engaging environment and offering constructive feedback while also considering individual personalities to help achieve creative goals. In Busuu, it was found that fostering an engaging environment and offering constructive feedback enhances creativity, while the nature of tasks influences the selection of cognitive mechanisms leading to more innovative results. HelloTalk displayed a more balanced distribution across press, person, propulsion, purpose, public, product, and process. It shows that HelloTalk tends to promote creativity more holistically and comprehensively. Therefore, it can be concluded that the gateway to creativity is the environment of CALL applications.

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Introduction

Creativity has long been a major focus of research because it plays a key role in individual achievement and the advancement of society (Sternberg et al., 2024). Both academic and popular discussions emphasize the significance of creative thinking skills for learners, with much emphasis placed on the necessity of integrating these skills into educational systems (Harris, 2016; Runco, 2014). The importance of creativity is particularly emphasized in the field of education, where administrators and policymakers advocate for more innovative schools and teachers capable of nurturing creative students who, in turn, can contribute to more creative societies (Jones & Richards, 2015). The European Commission on Languages (2009) declared the year 2009 "the year of creativity," stating that creativity is essential to both language learning and language teaching.

In parallel with the growing emphasis on creativity, advancements in technology have also become a critical aspect of modern education, particularly in English as a Foreign Language (EFL). Many language teaching roles today demand an understanding of both learning technology theory and practical digital literacy skills (Thomas et al., 2012). The rise of digital technology has ushered in a new era in education, offering innovative tools and methods that have the potential to transform the way teaching and learning occur (Damaševičius & Sidekerskienė, 2024). Bennett et al. (2000) claimed that the use of computer technology enhances both the effectiveness of teaching for educators and the learning outcomes for students in the classroom. Integrating computer technology enables teachers to better address the educational needs of their students (Ahmadi, 2018). Bransford et al. (2000) suggest that the use of computer technology allows teachers and learners to create local and global communities, facilitating connections with others and broadening their learning opportunities.

Given the intertwined roles of creativity and technology, their relationship must be explored to enhance EFL outcomes. When technology and learning are brought together, there is often an underlying assumption that creativity will naturally be part of the process (Warschauer & Matuchniak, 2010). The link between technology and creativity is frequently considered a major concern for education in the 21st century (Henriksen et al., 2018). To gain a deeper understanding of creativity and the creative process, it is essential to consider the context in which creative activities take place (Mishra & Henriksen, 2018). One of the most important contexts in this case is educational technology. To improve creativity in EFL learners, we must also consider the importance of creativity in educational technology. Engaging in creative tasks using new technologies can involve generating ideas, forming connections, producing and building, collaborating, communicating, and assessing outcomes (Loveless, 2002). It can be argued that human creativity fuels technological advancements, which then offer new environments and tools for creative expression (Henriksen et al., 2021). Scholars have proposed that educators and researchers need to gain a deeper understanding of this mutual relationship and place greater focus on it (Zhao, 2012). Globally, creativity and technology have

been recognized as key elements in shaping educational outcomes and future developments (Henriksen et al., 2021).

With an understanding of the interaction between creativity and technology, it becomes evident that integrating creativity into computer-assisted language learning (CALL) is vital for maximizing the benefits of EFL learning. Integrating creativity into CALL is essential for improving both engagement and the effectiveness of EFL learning. By emphasizing the capabilities of tools and exploring how they can support content in innovative and efficient ways, creativity becomes a key factor in leveraging technology for quality teaching (Henriksen et al., 2016). The mutual relationship between creativity and emerging technologies affects, firstly, teacher training and professional growth; secondly, the assessment of student learning and performance; and thirdly, the policies implemented to support both teachers and students in this field (Henriksen et al., 2016). Technology processes, tools, and interfaces revive interest in creativity and its expression, as demonstrated by numerous online activities that foster creative innovation (Tillander, 2011).

The rationale for conducting this study stems from the understanding that while creativity and technology share a mutually reinforcing relationship, their deliberate integration into CALL remains underexplored in EFL contexts. Given that this synergy critically influences teacher training, student assessment, and educational policy (Henriksen et al., 2016), and that digital tools inherently revive creative expression (Tillander, 2011), there is a pressing need to examine how embedding creativity into CALL can systematically enhance engagement and learning effectiveness. Therefore, the purpose of this study was to explore creativity in CALL applications to perceive the distribution of creativity in these applications. It investigated how creativity is represented in a selection of these applications according to the perspectives of the most active users. The current study aimed to address the following question:

- How is creativity distributed in these three popular CALL applications with the most active users: Duolingo, Busuu, and HelloTalk?

Literature review

Theoretical Underpinning: The 8Ps Theoretical Framework of Creativity

There is no complete agreement on how to define creativity. According to Csikszentmihalyi and Wolfe (2014), the intricate and varied aspects of creativity pose challenges for educational systems that typically adhere to standards or norms, requiring clear, consistent, and rigid frameworks. In common usage, creativity is often described as the process of creating something novel or imagining possibilities that have not been previously considered (Levin, 2008). Most definitions of creativity highlight novelty and effectiveness as two essential features of creative ideas or solutions (Plucker et al., 2004). Therefore, creativity refers to the capacity to generate or otherwise bring into existence something novel, whether it is a new solution to a problem, a new approach or tool, or an original artistic creation (Kerr, 2024).

In this study, we used the 8Ps framework to conduct the research proposed by Sternberg and Karami (2021). According to Sternberg and Karami (2021), the 8Ps framework is essential for defining and describing creativity because it provides a comprehensive structure that addresses the limitations of previous frameworks, which often focus on limited aspects of creativity. Sternberg and Karami also noted that the 8Ps framework facilitates a more comprehensive understanding of creativity by encompassing all significant factors involved in creative processes and outcomes. This framework is designed to explore the boundaries of creativity and address aspects that have been systematically overlooked.

The 8Ps are purpose, press, person, problem, process, product, propulsion, and public (Sternberg & Karamim, 2021). When referring to purpose, we seek to answer the question of "what is the purpose of creativity?" Creative contributions are, by definition, required to be both novel and useful. Press is related to the elements within an environment that encourage an individual or group to engage in creative behavior. Person is concerned with the personality of people and their different aspects. Problem deals with the specific challenge or task that initiates the creative process. Process refers to engaging learners in a creative context and asking them to follow the proper processes to complete a task more creatively. Product is the outcome of a creative process to solve a problem. Propulsion describes how a creative idea or product changes a field, product line, or way of thinking. Finally, public refers to the audience feedback on a creative product to see if it is according to the standards of a creative outcome or not. Therefore, in the current study, we attempted to see the representations of the 8Ps in the CALL materials.

CALL in EFL Teaching and Learning

The history of CALL demonstrates the evolution of the field of educational technology and language teaching methods. As stated by Warschauer and Healey (1998), the use of computers in language teaching can be traced back to the early 1960s and has evolved over the years into three major phases, namely, behavioristic CALL, communicative CALL, and integrative CALL. Based on the behaviorist learning theory, this form of CALL involved a lot of repetition of language functions, practice which has at times been pejoratively referred to as 'drill and kill' (Warschauer & Healey, 1998). This is the era of CALL, which can be argued with the least dealing with creativity due to the drill-based essence of technology usage in teaching and learning. The next phase, known as communicative CALL, emerged in the late 1970s and early 1980s, a time when behavioristic language teaching methods were being dismissed both theoretically and pedagogically. This is the time when creativity was more or less practiced in the communication practices through technology.

By the late 1980s and early 1990s, critics noted that computers were still being used in a haphazard and disconnected manner, contributing more to peripheral aspects rather than playing a central role in the language learning process (Kenning & Kenning, 1990, p. 90). This resulted in a new approach to technology and language learning, known as integrative CALL (Warschauer, 1996), a perspective that aims to combine different skills (such as listening,

speaking, reading, and writing) while also incorporating technology more extensively into the language learning process (Warschauer & Healey, 1998).

Challenges such as limited access to authentic language contexts and fluctuations in motivation levels within the EFL domain can be effectively addressed through innovative CALL solutions, including real-time feedback, multimedia resources, and collaborative learning opportunities. Tabssam et al. (2025) conducted a study to investigate the English language learners' feedback on Duolingo and Babbel. This research helps applied linguistics by highlighting the possible effect of user feedback to increase the usefulness of technologies related to language learning, which in turn leads to a more learner-centered approach in the building of pedagogical tools. In a study conducted by Abbasi (2022), the efficacy of integrating CALL into EFL settings was examined. He examined the impact of CALL tools on different language skills, including reading, listening, grammar, and writing. The results indicated that students performed better after using CALL technology. Syafryadin et al. (2021) conducted a study to investigate the experiences of pre-service English teachers in applying CALL applications. This research indicates that integrating CALL tools in English language teaching is an important factor in addressing technological and pedagogical challenges in the process of learning and teaching.

Khafaga and Alghawli (2021) conducted a study about the effect of CALL software on the reading skills of Saudi EFL students at Prince Sattam bin Abdulaziz University. The results indicated that the students' reading comprehension and their level of motivation were improved. Nami (2020) carried out a descriptive survey research to investigate the effect of language learning applications on the skills of language learning skills. Apps related to the dictionary and lexical domain were the most popular ones, and the students had an optimistic view about using these applications for language learning.

Enayati and Gilakjani (2020) investigated the effect of CALL on vocabulary development among Iranian intermediate EFL learners. The researchers highlighted the potential of CALL tools to improve EFL teaching by providing interactive and flexible learning environments. El-Esery and Radwan (2017) investigated the integration of CALL programs within flipped classrooms to enhance students' achievement and language learning attitudes. The results of the achievement tests showed signs of improvement, and participants expressed a high level of agreement with this approach.

Although various studies have been conducted on the effectiveness of CALL in developing different language skills among EFL learners, there is a lack of research regarding the distribution of creativity in CALL materials, including the various CALL applications used by many EFL learners due to the benefits they offer. This is the research gap that we attempted to deal with in the current study.

Empirical Studies of Creativity in Educational Technology

Technology is the result of creativity, and creativity is essential in every aspect of the technological revolution as well as in various fields of education (Riza, 2014). The application

of educational technology in language teaching and learning reveals possibilities for enhancing creative thinking skills. Numerous studies have explored this topic in various contexts, including interactive learning environments, digital tools, and educational games.

Zaremohzzabieh et al. (2025) conducted a meta-analysis study to examine the effect of educational technology interventions on improving creative thinking in educational settings, analyzing 35 pertinent empirical studies involving 2,776 participants. They investigated the relationship between educational technology interventions and the Torrance Tests of Creative Thinking (TTCT), along with its subscales. Overall, the findings revealed a moderate impact of educational technology on the total TTCT scale. Moreover, the results indicated that educational technologies influenced only three TTCT subscales, which are fluency, flexibility, and originality. Among the various interventions, interactive learning environments demonstrated medium to large mean effect sizes. Additionally, moderator analyses revealed that the effects on two TTCT subscales, flexibility and originality, are influenced by factors such as school type, research design, and intervention duration. The study concludes that interventions aimed at fostering students' creative thinking in diverse educational contexts are effective. Although Zaremohzzabieh et al. (2025) offer useful evidence that educational technology moderately enhances fluency, flexibility, and originality, their exclusive focus on the TTCT overlooks creativity dimensions more relevant to CALL, limiting the direct applicability of their findings to EFL language learning contexts.

Pikhart et al. (2024) conducted a study on exploring how digital learning affects creativity in the context of language education. The study employed the PRISMA methodology to gather data from two of the best databases, Scopus and Web of Science. The findings indicate that learning through a digital channel has a positive effect on creativity. They found that learning practices such as game-based learning, collaborative interaction, and real-world problem-solving tasks can develop creativity. Although Pikhart et al. (2024) show that digital learning practices like game-based learning can enhance creativity, their lack of quantitative synthesis limits the strength of conclusions specifically for CALL contexts.

Zare et al. (2016) conducted a quasi-experimental study about the effect of e-learning on university students' creativity. A total of 100 students from Payame Noor University in Hamedan, majoring in pure chemistry, were considered for the study. Out of these, 40 students were selected and evenly divided into two groups: an experimental group and a control group. Data was collected using two tools: a specially designed test on the Introduction to Chemistry course and the Abedi Creativity Inventory. The data analysis, conducted using an independent t-test with the aid of SPSS, revealed that the experimental group scored significantly higher on both knowledge and creativity measures. This finding suggests that e-learning is effective in enhancing knowledge and creativity among chemistry students, highlighting the need to expand e-learning opportunities to reach a broader audience.

Banihashem et al. (2014) employed a quasi-experimental method to investigate the impact of e-learning on students' creativity. The study population included all 2,500 students at Payame Noor University of Meshkin Shahr during the 2013-2014 academic year. The sample,

selected through convenience sampling, comprised 60 students who had completed two pre-elementary courses, and the Abedi Creativity Inventory was utilized as the research instrument. Statistical calculations were performed using SPSS software, and a t-test was applied to evaluate the hypotheses. The researchers concluded that e-learning is a powerful method for improving students' creativity, and educators and curriculum designers should focus on incorporating e-learning into their instructional approaches. Although Banihashem et al. (2014) report that e-learning improves creativity, their small convenience sample (n=60) and reliance on a single self-report inventory limit the generalizability and validity of their findings for broader CALL contexts.

We reviewed the studies related to examining the impact of educational technology on improving creativity. Pikhart et al. (2024) investigated the impact of digital learning on creativity in the context of language education, finding that learning through digital channels has a positive effect on creativity. Zare et al. (2016) indicated that e-learning is effective in increasing knowledge and creativity. Banihashem et al. (2014) declared that e-learning is a powerful method for increasing creativity. All of these studies have investigated the effects of technology on creativity; however, there is a gap in exploring creativity in CALL applications, which, in our study, are applications with the most active users, according to a comprehensive framework, such as the 8Ps of creativity. Therefore, this study aims to bridge this gap by exploring the distribution of creativity in CALL applications.

Method

Design

We applied a descriptive and deductive design to conduct the basic content analysis. Basic content analyses primarily serve a descriptive purpose (Drisko & Maschi, 2016). Krippendorff (2013) suggests that in descriptive research designs, understanding of content and context is more effectively operationalized and articulated. The descriptive aspect of the research focused on systematically documenting the presence of the 8Ps of creativity within CALL applications. The data consisted of a sample of CALL applications, selected based on popularity and usage in language learning contexts. Descriptive analysis involved the creation of predefined categories based on the 8Ps framework. According to Drisko and Maschi (2016), categories, whether broad or specific, should be designed to effectively align with our objectives and address the research question. A coding scheme was developed to categorize elements in CALL apps that relate to each of the 8Ps. Using descriptive content analysis, the manifest content was categorized and counted based on its alignment with the 8Ps and the results were presented in the form of Code Matrix Browsers, Code Maps, and Simple Code Pattern charts by using MAXQDA 24.

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Corpus of the Study

According to Meihami and Shabani (2023), selecting the most commonly used CALL applications is challenging due to the large number of CALL apps in use globally. In this study, we selected the three most active user CALL apps (both mobile and web-based) in October 2024, based on data from the Sensor Tower Website (*https://sensortower.com*). This website is a reliable source that offers valuable information for developers, marketers, investors, and researchers by analyzing app rankings, user demographics, and competitive benchmarks. We collected the data for analysis based on the activities, tasks, practices that the three applications provided at elementary level. These applications are Duolingo, Busuu, and HelloTalk. The selection criteria, as outlined by Meihami and Shabani (2023), include:

- Best free language learning apps: Their study identifies the most frequently used free language learning apps, based on their ability to meet basic psychological needs and active user engagement.
- Features that allow learners to study at their own pace: These apps emphasize autonomy by allowing learners to select their learning pace, tasks, and materials, catering to individual preferences.
- Ease of use and functionality: The apps are user-friendly and functional, integrating intuitive designs that support learners' autonomy and competence through accessible interfaces and feedback mechanisms.
- Popularity among learners: Apps like Duolingo rank highly among learners for their ability to address autonomy, competence, and relatedness, which enhances motivation and user satisfaction.
- Best market features: These apps incorporate features that simultaneously address psychological needs, such as autonomy-competence-relatedness combinations, making them highly competitive.
- Integration of learning into daily routines: The apps effectively integrate language learning into daily life by using gamified elements, notifications, and modular lesson designs, promoting consistent engagement.
- Suitability for every learning style: They provide diverse learning experiences (interactive exercises, collaborative tasks, and personalized feedback) to accommodate various learning styles and preferences.

Duolingo

This application was founded by Ahn and Hacker (2011). It covers 43 languages (at the time of conducting this study), including English, French, and Spanish. Its learning method incorporates gamification features, such as interactive and rewarding lessons, to motivate and engage learners throughout the learning process. To establish a well-defined context for practice, this application encourages short and daily lessons. It also provides an online language assessment. Duolingo, drawing on grammar-translation and behaviorist methods, provides a structured curriculum (Zhao et al, 2024).

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Busuu

This application is a language learning platform that enables learners to interact with native speakers. It was created by Niesner and Hilti (2008) and was named after the endangered language Busuu that belongs to Cameroon. It empowers self-study language learning by applying communicative elements of social learning. Its units are based on CEFR levels A1, A2, B1, B2, and C1.

HelloTalk

HelloTalk is a widely used language learning platform, managed by a team led by Zackery Ngai, the CEO and founder. This app, released in 2012. It is designed to support language learning and practice, enabling users to converse with friends as if they were real, and covers nearly all languages worldwide (Rosilah & Ulfa, 2024). HelloTalk, rooted in social constructivist learning theory and a communicative methodology, prioritizes interaction and communication over structured curriculum (Zhao et al., 2024). According to the app's description, HelloTalk is a mobile language learning tool that focuses on conversation. It facilitates cultural immersion, language learning, and practice in an easy, engaging, and intuitive manner by enabling users to connect and communicate in real-time with native speakers worldwide (Rosilah & Ulfa, 2024).

Data Source

We selected sections of Duolingo, Busuu, and HelloTalk that primarily focused on activities and exercises. Additionally, components such as in-app messages, designed to encourage more active learner engagement, were examined. These applications incorporated audio and video features to enhance learner motivation and promote more effective participation. By analyzing how creativity was embedded within the selected content of these applications, we aimed to address the research question. To enhance clarity, some of the selected activities and tasks from these applications are presented in the Appendix.

Data Analysis: Deductive Coding of 8Ps of Creativity

Describe According to Drisko and Maschi (2016), in basic content analysis, deductive coding lists are pre-established codes created before analysis, based on prior research and theory. They mention that these priori codes help researchers systematically analyze data by applying predefined categories. To address the research question, a pre-established deductive code list based on the 8Ps of creativity was used to examine the distribution of creativity in the selected applications. The pre-established codes are outlined below:

- **Purpose**:The code for purpose focuses on encouraging novel, useful, and purposeful language use. This involves setting clear creative goals that align with learning objectives, ensuring that learners understand why creative expression matters for authentic communication and real-world language application.

- **Press**: It refers to environmental factors, such as visual aesthetics, gamified elements, and all features that make a learning environment more engaging. Press may lower affective barriers to creative risk-taking.
- **Person**: The person code relates to individual traits like curiosity and risk-taking. Other relevant traits include openness to experience, intrinsic motivation, self-efficacy, tolerance for ambiguity, and a growth mindset, all of which influence how actively a learner engages with creative opportunities in CALL.
- **Problem**: It refers to tasks and activities within the selected applications. Well-designed problems are ill-structured, open-ended, and allow multiple solution pathways, encouraging learners to apply language flexibly rather than searching for a single correct answer.
- **Process**: It captures cognitive mechanisms used to generate creative solutions. These mechanisms include divergent thinking, analogical reasoning, brainstorming, idea recombination, and metacognitive monitoring, all of which can be scaffolded through explicit strategy instruction within digital environments.
- **Product**: It focuses on tangible outcomes, including short stories, speech recordings, and drawings. Products vary in complexity from simple sentence generation to multimedia projects, and their creativity can be assessed based on novelty, appropriateness, elaboration, and aesthetic quality within the target language context.
- **Propulsion**: It refers to the driving forces that push learners to exceed linguistic boundaries and go beyond what is typical. Propulsion arises from internal factors like personal investment and external factors like authentic audiences or challenges that demand creative repurposing of limited linguistic resources.
- **Public**: This refers to the community that validates and provides feedback on creative outputs, shaping the standards of novelty and value. The public can include peers, teachers, or broader online audiences, and their feedback functions as a social mechanism that refines creative judgment and motivates iterative improvement of language products.

It is critical to mention that to ensure the dependability of the study, a second coder, an expert in this field, analyzed the content. MAXQDA 24's Coding Agreement Tools were then used to assess the level of agreement between the two coders. To ensure the dependability of the findings, we shared 20% of the data with a colleague to be analyzed independently. The agreement between the two raters was was calculated based on Cohen's Kappa. The kappa (κ) was calculated for 20% of the data, revealing a value of 0.78 indicating substantial agreement (Landis & Koch, 1977).

Findings

In this section, we applied the Code Matrix Browser (CMB), Code Map, and Simple Code Configuration (SCC) to each application individually to explore patterns in Duolingo, Busuu, and HelloTalk . Subsequently, each analytical tool was applied to all three applications together, treating them as a unified dataset to explore cross-application coding patterns. To answer the

research question, which is a "how" question, we dealt with the data in two ways. First, we used CMB to examine the number of occurrences of each element of the 8Ps creativity framework in each application. Then, by utilizing the Code Map and SCC, he identified the co-occurrences in each application.

The Distribution of Creativity in Duolingo

CMB in MAXQDA is a tool for identifying the presence of codes in analyzed documents in a matrix format. This matrix displays the number of occurrences for each code in coded segments. The following matrix illustrates the distribution of the 8Ps of creativity across selected Duolingo materials.

From the 60 occurrences, press is the most frequent code, with 17 occurrences (28.3%), followed by problem, with a frequency of 11 (18.3%). The process accounts for 8 occurrences (13.3%), public for 7 (11.6%), product for 6 (10.3%), propulsion for 5 (8.3%), person for 4 (6.6%), and finally, purpose, which is the least frequent, with only 2 occurrences (3.3%).

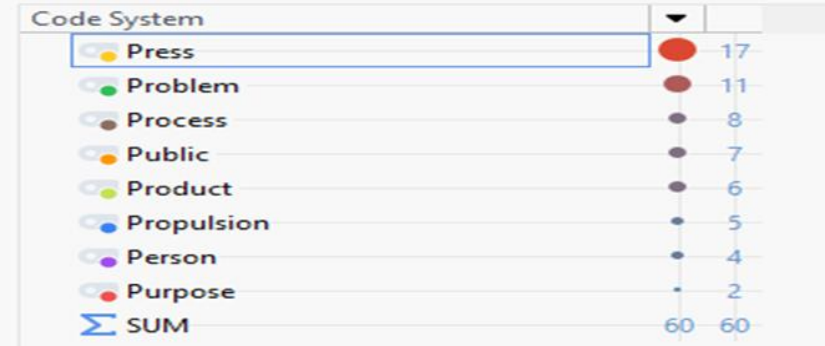

Figure 1. *Code Matrix Browser of Creativity Distribution in Duolingo*

Although CMB is very useful to show the patterns of code existence in the data, it fails to illustrate the co-occurrences of the codes, which is critical to obtain a more comprehensive overview of the patterns. To such end, we used Code Map. The Code Map is a visual analytics tool that illustrates the associations and co-occurrences of the codes within a dataset. It visualizes codes as points on a map, where the size of each point shows the frequency of that code. Points that are closer or directly associated suggest a stronger interaction, which can be considered as a theme. As shown in Figure 2, the Code Map provides deeper insight into the co/multiple-occurrences in the 8Ps of creativity in Duolingo. As illustrated in Figure 2, the closeness of the codes and the width of the lines linking them indicate how associated they appear. Significantly, press functions as the core node, demonstrating extensive interaction with nearly all other elements, which underscores its central influence within Duolingo's creative framework. It shares strong links, especially with problem, process, and product, suggesting that engaging environments affect tasks and activities, which in turn help learners select more appropriate thinking strategies and produce more tangible and creative outcomes.

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Press, public and propulsion are close to each other, indicating the significance of the association between environmental factors, community-related factors, and driving forces. It means that by creating a suitable and engaging environment and providing appropriate feedback, Duolingo pushes learners to go beyond the typical level of thinking, which results in training more creative learners. This is the second theme of this Code Map. Purpose and person are farther from the other codes. However, they reflect an important interaction between goal-driven factors and individual traits, indicating that considering different learners' personalities leads to the achievement of the goals of creativity. This is the third theme, according to Figure 2. Overall, the following Code Map highlights that environmental factors play a crucial role in Duolingo's creative structure by influencing challenges, the selection of strategies, and outcomes. On the other hand, an engaging environment with suitable feedback acts as a driving force to make learners more creative and taking different personality traits into account encourages learners to achieve the goals of creativity.

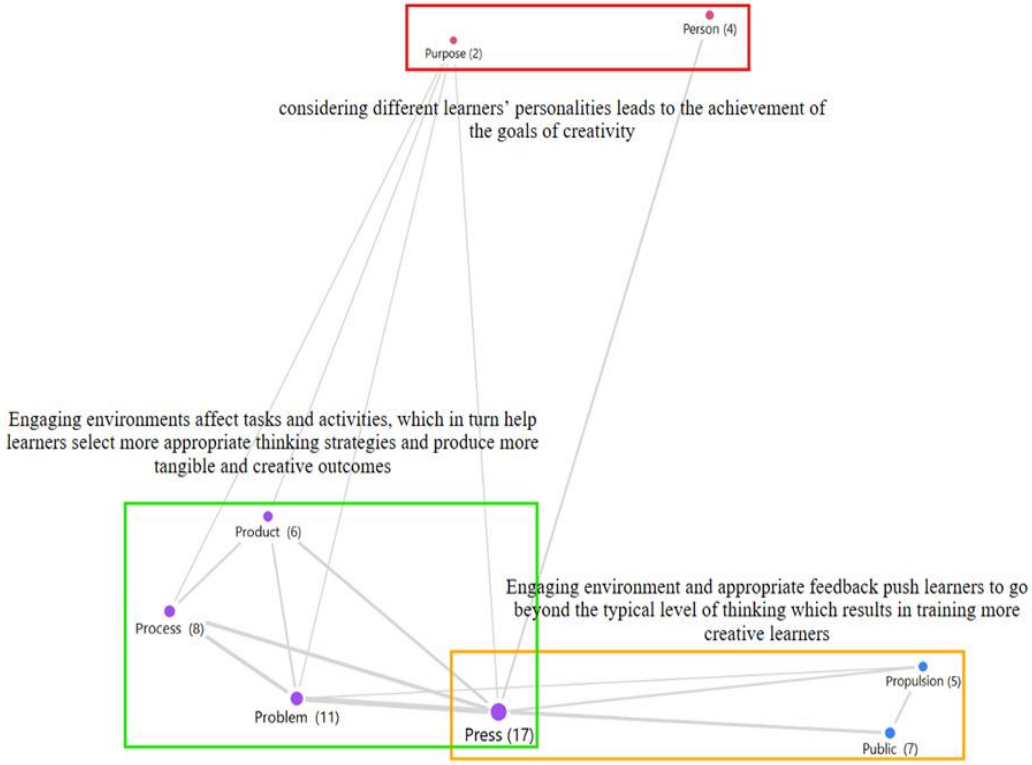

Figure 2. *Code Map for Duolingo: Co-Occurrences of the Codes*

Still to see if our understanding obtained from Code Map was correct and to find a deeper analysis, we used Simple Code Configuration. The Simple Code Configuration (SCC) is a visualization tool that shows the frequency of patterns within a dataset. It focuses on revealing which themes dominate and which appear less frequently. As shown in Figure 3, the most frequent combinations, which represent 18% of the coded segments, are person + press, product + process + problem + press, and public + propulsion + press. These dominant patterns, each

occurring three times, suggest that Duolingo's creative structure often integrates environmental factors with other dimensions of creativity. Another notable combination, consisting of product, process, problem, press, and purpose, accounts for 12% of the coded segments and occurred twice. Less frequent combinations, each appeared once and comprised 6% of the coded segments. Based on our analysis of the Code Map for Duolingo, we identified three themes: (a) environmental factors significantly influence how learners deal with doing tasks, selecting appropriate ways to do these tasks, and the tangible outcomes of doing these tasks; (b) considering different learners' personalities leads to the achievement of the goals of creativity; and (c) creating a suitable and engaging environment and providing appropriate feedback, pushes learners to go beyond the typical level of thinking which leads to have more creative learners. Figure 3 proves the presence of these themes in the distribution of creativity in Duolingo.

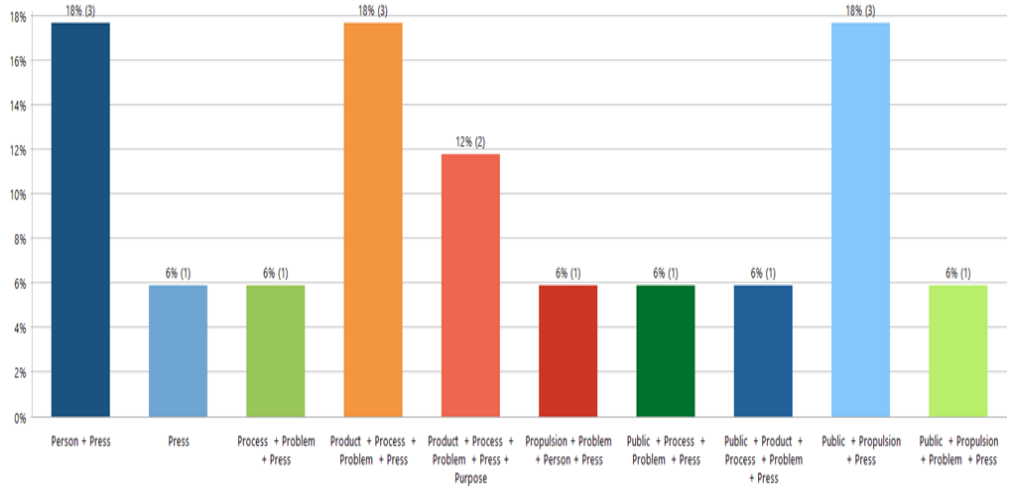

Figure 3. *Simple Code Pattern Chart for Duolingo*

The Distribution of Creativity in Busuu

The following matrix illustrates the distribution of the 8Ps of creativity across selected materials of Busuu. Of the 31 coded segments, press is the most frequent code, appearing 8 times (25.8%), followed by public with 6 occurrences (19.3%). Propulsion accounts for 5 segments (16.4%) and purpose for 4 (12.9%). Person, problem, process, and product each appear twice (each 6.4%), representing the lowest frequency.

Figure 4. *Code Matrix Browser for Busuu*

As shown in Figure 5, press emerges as a pivotal node at the center of the map, indicating its strong association with public, propulsion, and purpose. It means that making a rich environment and providing proper feedback push learners to exceed the present level of thinking to reach the goals of creativity. This is the first theme, according to Figure 5. The second theme is the influence of the type of tasks and activities on the selection of the right thinking mechanisms that lead to the production of more tangible and creative outcomes. So one theme in the following Code Map shows that creating an engaging context along with suitable feedback lead to train more creative learners who are pushed towards to go beyond the regular level of thinking and the other one indicates the impact of the type of tasks and activities on the thinking strategies which learners select to do these tasks and activities and consequently producing more tangible outcomes by doing these tasks and activities.

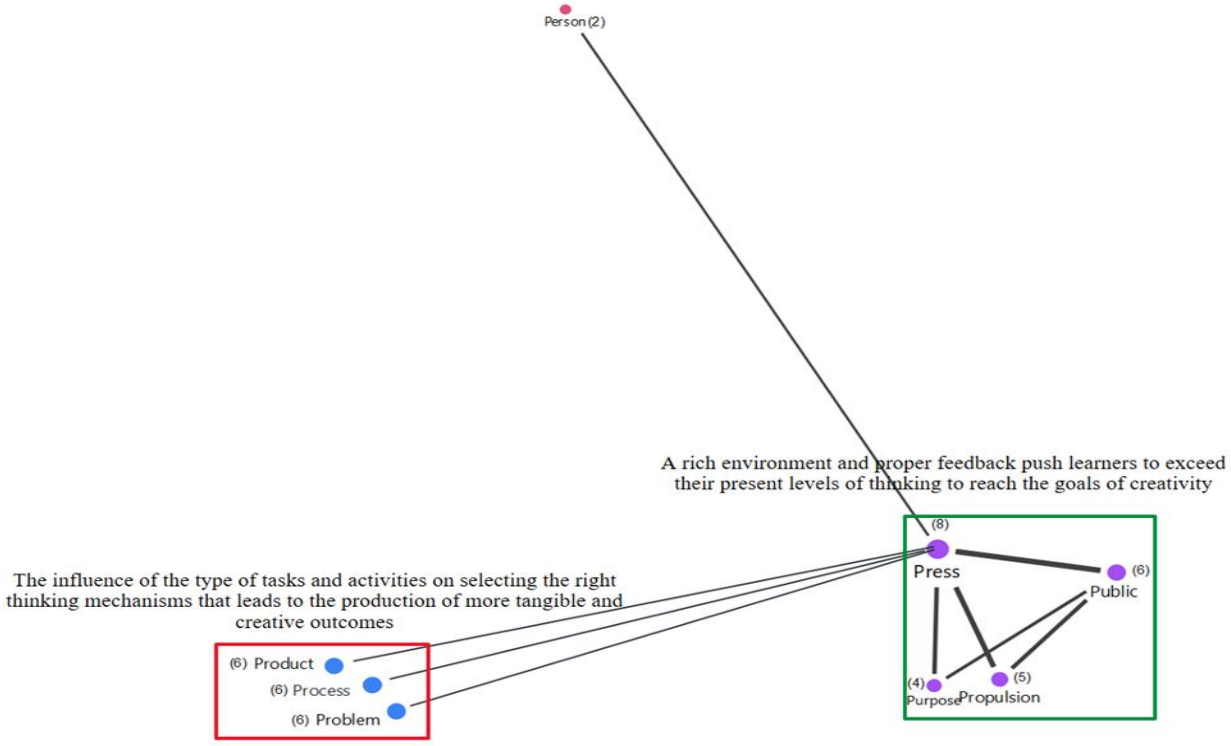

Figure 5. *Code Map for Busuu: Co-Occurrences of the Codes*

As shown in Figure 6, the most frequent combination, which is public + propulsion + press + purpose, occurred three times and accounts for 38% of the coded segments. This pattern confirms the first theme according to Code Map for Busuu, which is about the effect of environmental factors and the type of feedback on reaching the goals of creativity and pushing learners to go beyond their current thinking level. Another notable combination, consisting of person and press, represents 25% of the coded segments and occurred twice. Although these two codes in the Code Map are far apart, they are considered an important combination

according to the following chart. Less frequent combinations, each appearing once and comprising 13% of the coded segments, reflect more isolated patterns. The presence of process, problem, and product in two out of three of these combinations proves the second theme in the Code Map for Busuu, which shows the effect of task and activity types on applying the appropriate thinking process to achieve the more tangible and creative outcomes.

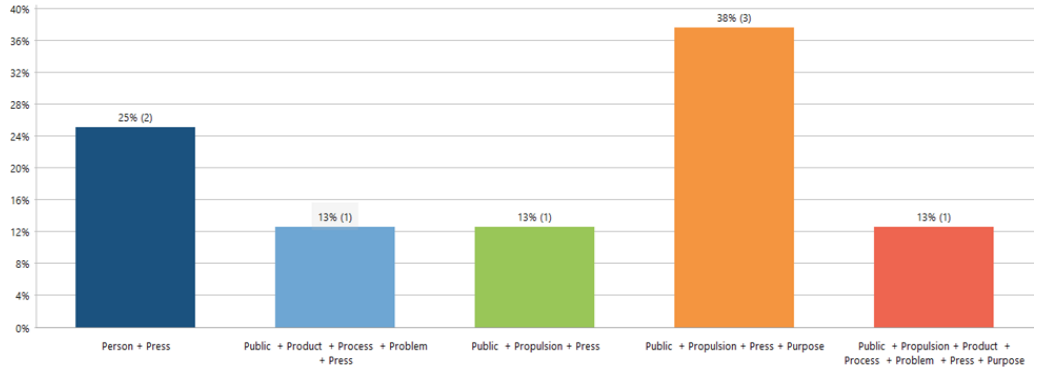

Figure 6. *Simple Code Pattern Chart for Busuu*

The Distribution of Creativity in Hellotalk

The following matrix illustrates the distribution of the 8Ps of creativity across selected materials of HelloTalk. Of the 27 coded segments, purpose, press, propulsion, and public are the most frequent codes, each appearing four times (14.8%). They are followed by person, process, and product, with three occurrences each (11.1%). Problem has the lowest frequency, appearing twice (7.4%).

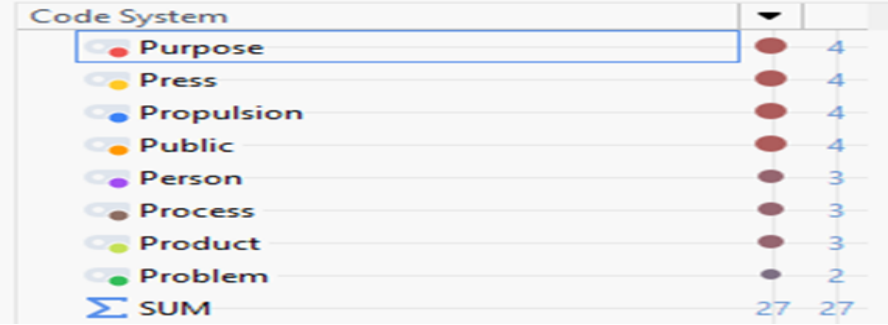

Figure 7. *Code Matrix Browser for HelloTalk*

As shown in Figure 8, the elements public, propulsion, purpose, product, process, and press form a zone which indicates that making an engaging environment and providing suitable feedback lead to the selection of proper cognitive mechanisms to do the tasks which results in more tangible and creative outcomes and consequently lead to the achievement of the goals of creativity and this achievement pushes learners forward to be more creative. This is the first theme according to the following Code Map. The other zone consists of press and person, which shows that the environment of HelloTalk affects learners according to their individual traits. This is the other theme, according to Figure 8. Overall, the following Code Map indicates that

creating interesting contexts and giving proper feedback result in selecting appropriate thinking processes to do the tasks, which leads to more creative products along with the goals of creativity. This can push learners to become more creative. On the other hand, learners are influenced by the environment of the application according to their individual personalities.

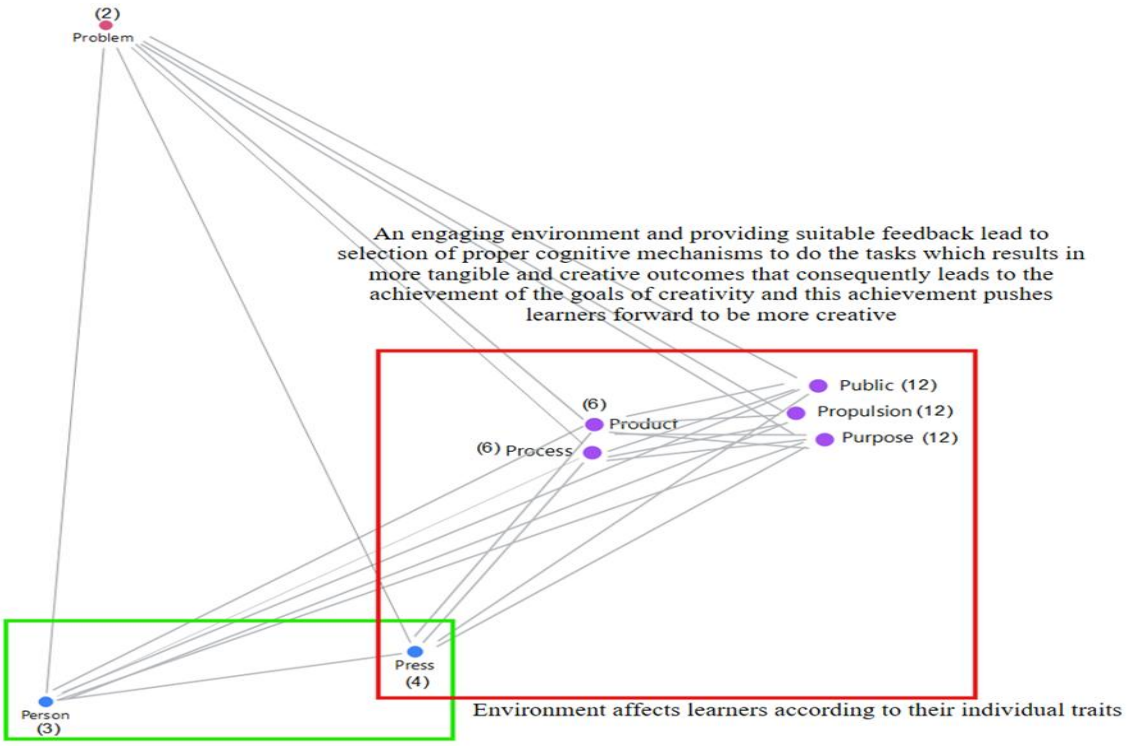

Figure 8. *Code Map for HelloTalk: Co-Occurrences of the Codes*

As shown in Figure 9, among the four identified patterns, the most prevalent is the combination of all eight codes, which appears in 40% of the cases. This confirms the first theme of the Code Map for HelloTalk, which emphasizes the influence of environment and feedback on tasks, cognitive mechanisms, tangible outcomes, and achieving the goals of creativity and driving forces that motivate learners to be more creative. According to the following chart, a person and press form a combination that proves the second theme of the Code Map for HelloTalk, which is the influence of the environment of this application on each learner according to their personalities. The other bars in the following chart again prove the first theme.

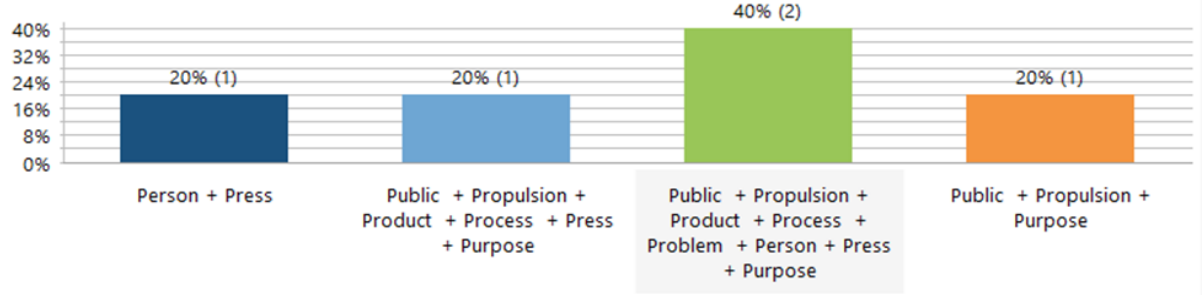

Figure 9. *Simple Code Pattern Chart for HelloTalk*

A Comparison of the Distribution of Creativity Across Duolingo, Busuu, and HelloTalk

Based on the findings from the CMB, Code Map, and SCC regarding the distribution of creativity in Duolingo, we found that Duolingo addresses creativity by making an attractive environment to affect tasks and activities, which leads to the selection of more appropriate cognitive mechanisms by learners and consequently produces more creative outcomes. On the other hand, by considering different learners' personalities, Duolingo makes achieving the goals of creativity much easier. Besides, by creating an engaging environment and providing constructive feedback, Duolingo encourages learners to go beyond their current level of thinking.

In Busuu, making a rich environment and providing proper feedback push learners forward to be more creative and therefore result in achieving the goals of creativity. On the other hand, Busuu creates tasks and activities in such a way that they trigger learners to select more appropriate thinking processes for completing them, which in turn leads to more creative products.

In HelloTalk, making an engaging environment and providing proper feedback make learners select appropriate cognitive mechanisms to do the tasks, which results in more creative outcomes and consequently pushes learners to go beyond the regular thinking boundaries to achieve the goals of creativity. On the other hand, HelloTalk tries to create an environment that affects learners according to their individual traits.

Examining Creativity Patterns in Duolingo, Busuu, and HelloTalk Collectively

The following matrix (Figure 10) illustrates the distribution of the 8Ps of creativity across the materials of HelloTalk, Duolingo, and Busuu collectively. Of the 118 coded segments, Press is the most frequent code with 29 occurrences (24.5%). Public is the next code with 17 occurrences (14.4%), followed by Problem with 15 occurrences (12.7%), Propulsion with 14 (11.8%), Process with 13 (11%), Product with 11 (9.3%), Purpose with 10 (8.4%), and Person with 9 occurrences as the code with the least frequency (7.6%).

Figure 10. *Code Matrix Browser for HelloTalk, Duolingo, and Busuu*

As shown in Figure 11, Press occupies a central position and has the highest frequency of occurrence. It shows that environmental factors are the most important elements in the

distribution of creativity in these three applications. Notably, the combination of Public, Propulsion, Purpose, and Press indicates that by creating an engaging environment and providing suitable feedback, learners are encouraged to go beyond their usual thinking levels to achieve the goals of creativity. This is the first theme of this Code Map. The second theme consists of Press, Problem, Process, and Product, indicating that attractive environments affect tasks and activities, which in turn help learners select more appropriate thinking strategies and produce more tangible and creative outcomes. As illustrated in the following Figure, Person has the lowest frequency of occurrence and is more distant from the other codes. However, the link between Press and Person is strong enough to consider them in one combination, which indicates that the environment of these applications affects learners according to their personality traits.

As shown in Figure 12, the combination of Person and Press is the most frequent pattern, representing 20% of the coded segments. It confirms the strong link between Press and Person in the Code Map (Figure 11), indicating that environments of Duolingo, Busuu, and HelloTalk influence learners according to their different personality features. Other prominent pattern includes Public, Propulsion, and Press at 13% which confirms that the engaging environments of these applications and the constructive feedback they provide and push learners to go beyond their current thinking levels and become more creative. The other two combinations with the percentage of 10 in the following chart confirm the influence of an engaging environment and proper feedback on driving learners towards being more creative according to the goals of creativity (Press + Public + Propulsion + Purpose) and the impact of attractive environments on tasks and activities which help learners select more effective thinking strategies and produce more tangible and creative outcomes (Press + Problem + Process + Product). The rest of the combinations, which represent 7% and 3% of the coded segments, also confirm the presence of the themes from analyzing of the Code Map for Duolingo, Busuu, and HelloTalk.

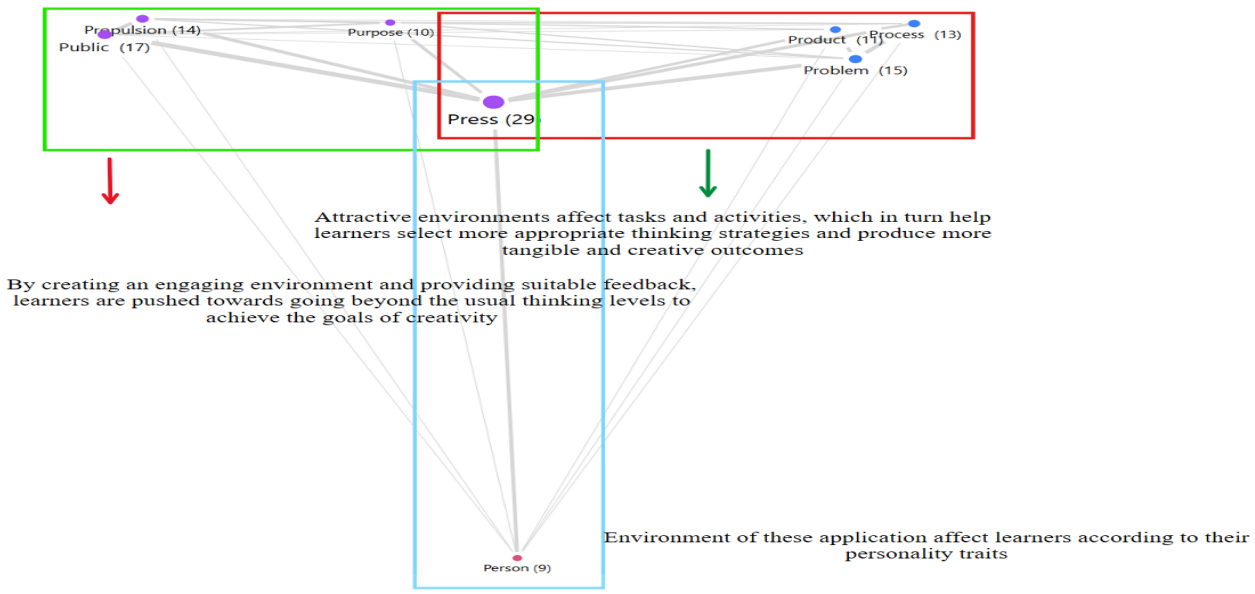

Figure 11. *Code Map for HelloTalk, Duolingo, and Busuu*

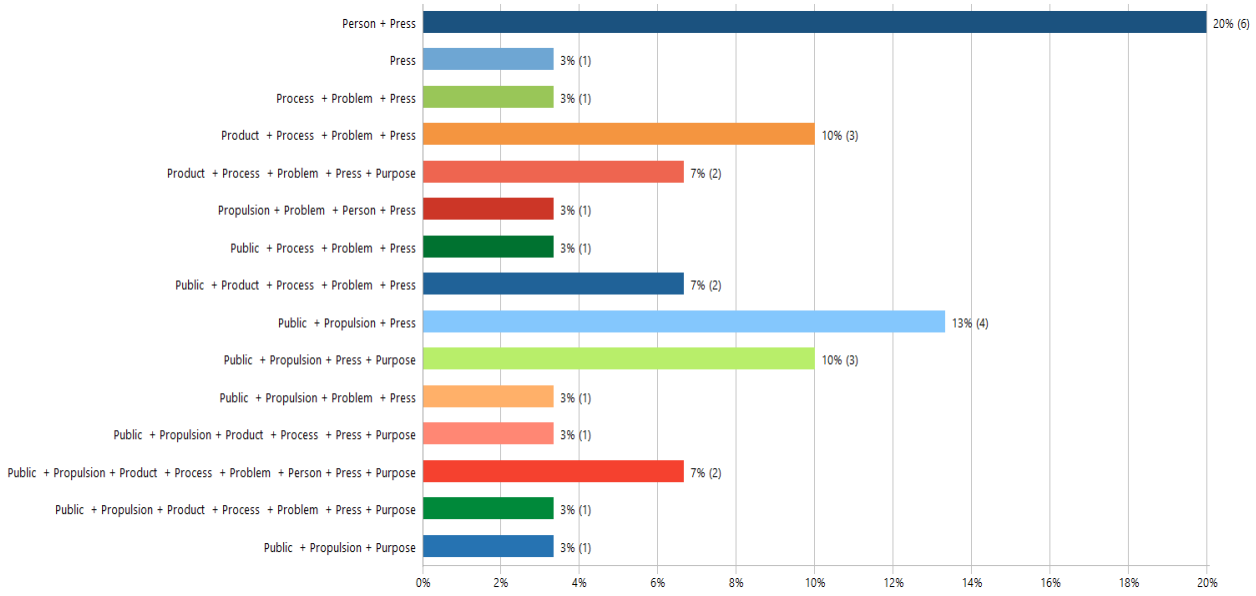

Figure 12. *Simple Code Pattern Chart for HelloTalk, Duolingo, and Busuu*

Discussion

This study investigated the distribution of creativity in HelloTalk, Duolingo, and Busuu, based on the 8Ps of creativity framework developed by Sternberg and Karami (2021). The selected content and activities of these applications were coded and analyzed using MAXQDA 24. By applying the CMB, Code Map, and SCC to the selected materials of content and activities of Duolingo, Busuu, and HelloTalk, this research uncovered several significant findings. First, the separate analyses revealed distinct yet converging tendencies in how creativity was distributed according to the 8Ps framework of creativity. In Duolingo, we identified three themes. The first theme indicates that the attractive environment of Duolingo influences how learners engage with tasks and activities to select the more appropriate thinking processes in order to produce more tangible and creative outcomes. It aligns with Eskildsen's (2014) claim that the playful use of language and repetition as a task fosters creativity. Arshavskaya (2015) also highlighted the importance of creative assignments in enhancing critical thinking. The second theme reveals that by creating an engaging environment and providing constructive feedback, Duolingo encourages learners to go beyond the ordinary thinking levels, which leads to training more creative learners. The third theme indicates that considering learners' different personalities leads to the achievement of the goals of creativity. In Busuu, we identified two themes. The first theme indicates that forming an engaging environment and providing proper feedback act as a driving force to push learners to go beyond the ordinary thinking levels to achieve the goals of creativity. The second theme shows that the type of tasks and activities influences the

selection of the more appropriate cognitive mechanisms, which leads to the production of more tangible and creative outcomes.

HelloTalk displayed a more balanced distribution across press, person, propulsion, purpose, public, product, and process. It shows that HelloTalk tends to promote creativity more holistically and comprehensively. According to Figure 8, the combination of environmental features and different personality types of learners suggests that HelloTalk considers individual traits in its setting to enhance creativity in learners. On the other hand, according to the Code Map for HelloTalk, we identified two themes. The first theme indicates that making an attractive environment and providing proper feedback leads to the selection of appropriate cognitive mechanisms to do the tasks, which results in more tangible and creative outcomes that act as a driving force to push learners to transcend the usual limits of thinking levels and consequently leads to the achievement of the goals of creativity. The second theme shows that the environment of HelloTalk affects learners according to their personality traits. As illustrated in the Simple Code Pattern (Figure 9), the most frequent pattern that accounts for 40% of the occurrences includes all the 8Ps, suggesting that HelloTalk demonstrates the most comprehensive distribution of creativity. Notably, Figure 9 shows that the press appears in three out of four patterns, reinforcing its central role in shaping the creative structure. It is in line with Pikhart et al. (2024), whose study demonstrated that elements such as game design, interactive technologies, digital narratives, and collaborative learning settings can enhance students' creative development.

The findings highlight that across all three applications, press functions as a thematic anchor, aligning with the notion that creativity is more heavily influenced by environmental factors, particularly in conjunction with learners' personality traits. This finding aligns with Suzuki et al. (2022), who claim that the personality dimension of creativity plays a positive role in second language speech production. Moreover, the prominence of public and propulsion suggests that fostering collaboration, community engagement, feedback mechanisms, and sustained motivational forces is essential for promoting creative language learning experiences. However, the relatively lower occurrence of person and purpose across the datasets indicates potential gaps in personalization and goal-oriented innovation. This stands in contrast to Li and Wei's (2025) view that creativity develops through the interplay of cognitive processes and non-cognitive factors, including individual personality characteristics.

Conclusion

Refer The present study aimed to explore the distribution of creativity across three selected CALL applications. The results of the study indicate that creativity is distributed across Duolingo, Bussu, and HelloTalk, but there are similarities and differences between the patterns of this distribution. Press, which refers to environmental features, appears prominently across these three applications and indicates the significance of this element for incorporating creativity in these applications. It can be concluded that the gateway to creativity is the environment of these applications. On the other hand, in Duolingo, task-related factors are in

the second level of importance, which indicates the special focus of this application on tasks and activities. Tabssam et al. (2025) claim that Duolingo users mainly value the game-like features and the straightforward structure of the lessons. So, it can be concluded that well-structured tasks and activities represent the next stage on the path to creativity.

While in Busuu and HelloTalk, community-related factors, driving forces, and goal-driven factors are considered as elements with a higher level of priority. Shibata (2020) claims that in Busuu, learners are able to get feedback on their speaking and writing from native speakers. Nushi et al. (2018) argue that HelloTalk serves as an effective language learning platform because of its interactive community, practical functions, and opportunities for meaningful learning. It can be concluded that Busuu and HelloTalk focus on enhancing creativity mainly by providing feedback, which in turn motivates learners to create products that are novel and useful.

This study has some limitations. First, this research did not include all the language learning applications. Different outcomes might emerge if the other CALL applications were taken into account. Second, due to the limited access to premium features, the examination was restricted to the free functionalities of the selected applications. Finally, we focused primarily on tasks and activities as well as some selected sets of content features.

This study suggests that future research should consider a wider range of language learning applications, which include less widely used or emerging tools, in order to further expand knowledge about the distribution of creativity. Other researchers can also investigate how creativity is distributed in CALL materials for target languages other than English. They can examine the premium features of CALL materials to identify differences in the distribution of creativity.

Bio-data

First Author: collected data, designed, conducted the procedure, and wrote the first draft.

Second Author: read, made necessary revisions, and approved the final manuscript.

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References

Abbasi, P. (2021). The efficacy of implementing CALL into EFL settings. SSRN. https://ssrn.com/abstract=3950292

Ahmadi, D. M. R. (2018). The use of technology in English language learning: A literature review. *International Journal of Research in English Education*, *3*(2), 115-125.

Arshavskaya, E. (2015). Creative writing assignments in a second language course: A way to engage less motivated students. *InSight: A Journal of Scholarly Teaching, 10*, 68–78.

Banihashem, K., Farokhi Tirandaz, S., Shahalizadeh, M., & Mashhadi, M. (2014). The effect of e-learning on students' creativity. *Interdisciplinary Journal of Virtual Learning in Medical Sciences*, *5*(4), 53-61.

Bennett, D., Culp, K. M., Honey, M., Tally, B., & Spielvogel, B. (2000). *It all depends: Strategies for designing technologies for educational change*. Paper presented at the International Conference on Learning Technology, Philadelphia, PA

Bransford, J., Brown, A. L., & Cocking, R. (2000). *How people learn: Brain, mind, experience, and school*. National Academy Press.

Csikszentmihalyi, M., & Wolfe, R. (2014). New conceptions and research approaches to creativity: Implications of a systems perspective for creativity in education. In M. Csikszentmihalyi (Ed.), *The systems model of creativity* (pp. 161–184). Springer

Damaševičius, R., & Sidekerskienė, T. (2024). Virtual worlds for learning in metaverse: A narrative review. *Sustainability*, *16*(5), 2032. https://doi.org/10.3390/su16052032

Drisko, J. W., & Maschi, T. (2016). *Content analysis*. Oxford University Press.

El-Esery, A. M., & Radwan, N. A. (2017). Modeling CALL programs in EFL flipped classrooms to enhance achievement and language learning attitude. *Journal of Research in Curriculum Instruction and Educational Technology, 3*(2), 115–125.

Enayati, F., & Gilakjani, A. P. (2020). The impact of computer-assisted language learning (CALL) on improving intermediate EFL learners' vocabulary learning. *International Journal of Language Education, 4*(1), 96–112. https://doi.org/10.26858/ijole.v4i1.11663

Eskildsen, S. W. (2014). What's new?: A usage-based classroom study of linguistic routines and creativity in L2 learning. *IRAL: International Review of Applied Linguistics in Language Teaching*, *52*(1).

European Commission. (2013). *Creativity in language learning*. http://ec.europa.eu/language-es/language-teaching/creativity-and-language_en.htm

Harris, A. (2016). *Creativity, education and the arts*. Palgrave Macmillan.

Henriksen, D., Creely, E., Henderson, M., & Mishra, P. (2021). Creativity and technology in teaching and learning: A literature review of the uneasy space of implementation. *Educational Technology Research and Development*, *69*(4), 2091–2108. https://doi.org/10.1007/s11423-020-09912-z

Henriksen, D., Henderson, M., Creely, E., Ceretkova, S., Černochová, M., Sendova, E., Sointu, E. T., & Tienken, C. H. (2018). Creativity and technology in education: An international perspective. *Technology, Knowledge and Learning*, *23*(3), 409–424. https://doi.org/10.1007/s10758-018-9380-1

Henriksen, D., Mishra, P., & Fisser, P. (2016). Infusing creativity and technology in 21st century education: A systemic view for change. *Journal of Educational Technology & Society*, *19*(3), 27-37.

Jones, R. H., & Richards, J. C. (2015). *Creativity in language teaching*. In Routledge eBooks. https://doi.org/10.4324/9781315730936

Kenning, M.-M., & Kenning, M. J. (1990). *Computers and language learning: Current theory and practice*. Ellis Horwood.

Kerr, B. (2024, August 13). *Creativity. Encyclopedia Britannica*. https://www.britannica.com/topic/creativity

Khafaga, A., & Alghawli, A. S. A. (2021). The impact of CALL software on the performance of EFL students in the Saudi university context. *International Journal of Advanced Computer Science and Applications, 12*, 304–312. https://doi.org/10.14569/IJACSA.2021.0121137

Krippendorff, K. (2013). *Content analysis: An introduction to its methodology* (3rd ed.). Sage Publications.

Landis, J. R., & Koch, G. G. (1977). An application of hierarchical kappa-type statistics in the assessment of majority agreement among multiple observers. *Biometrics*, 363-374.

Levin, C. (2008). *Creativity in the school context*. Department of Psychology, Lund University.

Li, C., & Wei, L. (2025). The enhancement of creativity through foreign language learning: Do personality traits matter?. *Bilingualism: Language and Cognition*, *28*(2), 510-521.

Loveless, A. (2002). *Literature review in creativity, new technologies and learning*.

Meihami, H., & Shabani, M. B. (2023). Examining autonomy, competence, and relatedness in CALL: The case of CALL apps with the most active users. *Computer Assisted Language Learning*, *24*(1), 222-241.

Mishra, P., & Henriksen, D. (2018). *Creativity, technology & education: Exploring their convergence*. Springer International Publishing.

Nami, F. (2019). Educational smartphone apps for language learning in higher education: students' choices and perceptions. *Australas. J. Educ. Technol. 36*, 82–95. doi: 10.14742/ajet.5350

Nushi, M., & Makiabadi, H. (2018). HelloTalk: A language exchange app on your smartphone. *Roshd Journal of Foreign Language Teaching*, *33*(2), 16-23.

Pikhart, M., Habeb Al-Obaydi, L., & Klimova, B. (2024). Does digital learning stimulate creativity?. *Cogent Arts & Humanities*, *11*(1), 2407103.

Plucker, J. A., Beghetto, R. A., & Dow, G. T. (2004). Why isn't creativity more important to educational psychologists? Potentials, pitfalls, and future directions in creativity research. *Educational Psychologist*, *39*(2), 83–96.

Riza, E. T. (2014). *Creativity: A new era in educational technology*. DergiPark (Istanbul University). https://dergipark.org.tr/tr/pub/sakaefd/issue/11224/134159

Rosilah, I., & Ulfa, S. M. (2024). The use of Hello Talk application for speaking skills: A case study of online language learners for senior high school. *Edulitics (Education, Literature, and Linguistics) Journal*, *9*(1), 33-40.

Runco, M. A. (2014). *Creativity: Theories and themes*. Scholastic Testing Service.

Sensor Tower. (n.d.). *Market-leading digital intelligence*. https://sensortower.com

Shibata, N. (2020). The usefulness of Busuu online courses for foreign language learning. *Computer-Assisted Language Learning Electronic Journal*, *21*(2), 197-203.

Sternberg, R. J., & Karami, S. (2021). An 8P theoretical framework for understanding creativity and theories of creativity. *The Journal of Creative Behavior*, *56*(1), 55–78. https://doi.org/10.1002/jocb.516

Sternberg, R. J., Glăveanu, V., and Kaufman, J. C. (2024). In quest of creativity: three paths toward an elusive grail. *Creat. Res. J.* 36, 155–175. doi: 10.1080/10400419.2022.2107299

Suzuki, S., Yasuda, T., Hanzawa, K., & Kormos, J. (2022). How does creativity affect second language speech production? The moderating role of speaking task type. *TESOL Quarterly*, *56*(4), 1320–1344. https://doi.org/10.1002/tesq.3104

Syafryadin, S., Pratiwi, V. U., & Wardhana, D. E. C. (2021). Pre-service English teachers' experience with various CALL applications: Hindrances and reflection. *Studies in English Language and Education, 8*(1), 99–114. https://doi.org/10.24815/siele.v8i1.17690

Tabssam, H. A., Chattha, S. A., Javeed, M. F., & Hayat, A. (2025). Sentiment Analysis of User Reviews: Exploring Duolingo and Babbel in English. *Frontiers in Computer Science*, *7*, 1569058.

Thomas, M., Reinders, H., & Warschauer, M. (2012). *Contemporary computer-assisted language learning*. http://ci.nii.ac.jp/ncid/BB10863682

Tillander, M. (2011). Creativity, technology, art, and pedagogical practices. *Art Education*, *64*(1), 40–46. https://doi.org/10.1080/00043125.2011.11519110

Warschauer, M. (1996). *Computer-assisted language learning: An introduction*. In S. Fotos (Ed.), Multimedia language teaching (pp. 3-20). Logos

Warschauer, M., & Healey, D. (1998). Computers and language learning: An overview. *Language Teaching*, *31*(2), 57–71. https://doi.org/10.1017/s0261444800012970

Warschauer, M., & Matuchniak, T. (2010). New technology and digital worlds: Analyzing evidence of equity in access, use, and outcomes. *Review of Research in Education, 34*(1), 179–225. https://doi.org/10.3102/0091732X09349791

Zare, M., Sarikhani, R., Salari, M., & Mansouri, V. (2016). The impact of e-learning on university students' academic achievement and creativity. *Journal of Technical Education and Training*, *8*(1). https://penerbit.uthm.edu.my/ojs/index.php/JTET/article/download/1152/894

Zaremohzzabieh, Z., Ahrari, S., Abdullah, H., Abdullah, R., & Moosivand, M. (2025). Effects of educational technology intervention on creative thinking in educational settings: a meta-analysis. *Interactive Technology and Smart Education*, *22*(2), 235-265.

Zhao, D., Jablonkai, R. R., & Sandoval-Hernandez, A. (2024). Enhancing willingness to communicate in English among Chinese students in the UK: The impact of MALL with Duolingo and HelloTalk. *Journal of China Computer-Assisted Language Learning*, (0).

Zhao, Y. (2012). *World class learners: Educating creative and entrepreneurial students*. Corwin Press.

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Appendix

Examples of Activities Extracted and Analyzed from Duolingo, Busuu, and HelloTalk