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Exploring Consciousness-Raising of a Genre-Based Pedagogy through Virtual Reality for Academic Writing Development in Iranian EFL Context

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Abstract

This study innovatively reports on the use of a genre teaching course through virtual reality (VR) to enhance the writing proficiency of six Iranian EFL writers. The teaching and learning process was carried out in a cycle included setting the context, modeling, joint construction, independent construction, and comparing the texts. Notably, at the second stage of the cycle, virtual reality was capitalized for the deconstruction of the culture-bound conventions of the genre of information report as the focus of the study. Data were collected through learners' pre-test and post-test writing samples, semi-structured interviews, and experts' feedback. A genre analysis framework of the Sydney genre school was applied to examine the macro-level features, while micro-level analysis focused on lexical density and nominalization using principles from systemic functional linguistics (SFL). Findings reveal that VR-enhanced genre pedagogy significantly raised learners' awareness of macro-structural and micro-linguistic features, yielding more coherent and informationally dense texts. The study demonstrates VR's potential as a consciousness-raising tool in genre-based EAP instruction, offering practical implications for curriculum designers and educators seeking to integrate technologically enriched, culturally informed writing pedagogy.

Keywords: pedagogical innovation, genre-based approach, English for academic purposes (EAP), consciousness-raising pedagogy, immersive learning, EFL writers.

Introduction

In the intersection of education and technology, genre-based pedagogy through virtual reality promises an innovative pathway for teaching academic writing in English for Specific Purposes (ESP) and English for Academic Purposes (EAP).The literature on EAP, suggests that the theoretical orientation of the overall practices on writing revolves around three major categories of language-based, culture-based, and language-culture hybrid approaches. The third orientation is enacted most systematically within genre-based approaches (GBA) that foreground both cultural understanding and linguistic form (Dashtestani & Stojković, 2016; Estaji, 2024; Flowerdew, 2002; Hyon, 2017; Jodairi Pineh et al., 2017; Knapp & Watkins, 2005; Mickan, 2013; Miller & Dousay, 2015). By immersing learners in virtual environments, they would actively engage with the

communicative purposes and structures inherent to different genres thus making explicit the communicative purposes and structural choices that underlie different academic genres (see, for example, Li, 2022; Pack et al., 2020; Tan et al., 2023). As educational paradigms shift increasingly toward experiential and constructivist methods, the incorporation of VR has garnered attention for its potential to revolutionize genre-based learning and writing instruction, making complex concepts more accessible and engaging for students at all levels (Southgate, 2020).

White et al. (2015) assert that native speakers of a language do not need explicit instruction about the genre compared to marginalized and non-native speakers. This advantage is due to their exposure to language use and culture. This hidden knowledge emanated from native natural life exposure to language patterns, which are required later at school to help individuals predict the texts' specific linguistic and cultural features. Accordingly, the explicit teaching of genre is required for non-native speakers as language features represent the conscious choices in meaning-making or communication (Halliday & Matthiessen, 2004; White et al., 2015).

EAP/ESP learners frequently struggle with genre-specific expectations that extend beyond grammar and vocabulary to include rhetorical structure, register, audience awareness, and culturally mediated norms of evidence and persuasion. These difficulties are exacerbated in contexts where students have limited access to authentic disciplinary communities, authentic interlocutors, or situated practice (White et al., 2015; Halliday & Matthiessen, 2004). Traditional classroom methods such as text analysis, static exemplars, and role-play often fail to reproduce the embodied, multimodal, and social dynamics of genre performance; they can make schematic moves appear abstract and decontextualized. VR has the potential to resolve several of these problems by simulating authentic, situated discourse environments (e.g., laboratories, conferences, professional meetings) in which learners can practice genre enactment, receive contextualized scaffolding, and observe the pragmatic effects of rhetorical choices .Yet despite this promise, there is a paucity of rigorous empirical research that investigates how VR can be integrated into the specific modeling (deconstruction) phase of Sydney-school GBA cycles particularly within under-researched EFL settings such as Iran. This lacuna motivates the present study.

This study is significant on several fronts. First, it applies VR in a genre-based pedagogical method in an area not yet fully explored despite growing interest in multimodal and digital literacy technologies. Second, it empirically investigates the effect of VR-facilitated modeling on macro and micro language development in academic writing, by grounding itself in models based on systemic functional linguistics (SFL). Third, it provides visions of learners' impressions and experts' feedback towards developing a comprehensive understanding of how immersive technology can mediate genre learning. By examining the influence of VR-backed genre pedagogy on Iranian EFL learners, this study contributes to the ongoing discussion with regard to the ways in which educational technology might mediate theoretical models and teaching practice in the field of EAP/ESP. The findings should help inform curriculum developers, teacher educators, and policymakers striving to integrate technological innovation with linguistically and culturally grounded writing pedagogy such as GBA.

In addition, this study specifically concentrates on explicit teaching of macro features of the information report genre through VR deconstruction bringing cultural features to the forefront as a consciousness-raising technique. In other words, while no particular activity is dedicated to the teaching of the micro language features in the class, the study investigates the changes in both macro and its interrelated micro language features. Finally, the study solicits learners' impressions and experts' feedback to triangulate textual change with affective and professional perspectives.

In sum, this research seeks to demonstrate how VR, when deliberately integrated with GBA and grounded in systemic functional linguistics, can mediate the socio-cultural and textual features of academic genres, thereby bridging the gap between abstract analysis and situated practice. The findings are intended to inform curriculum designers, teacher educators, and policymakers about practical, scalable ways to integrate immersive technologies with linguistically and culturally grounded writing pedagogy in EAP/ESP contexts.

2. Literature Review

The genre-based approach has evolved over three decades of action research, primarily originated in Australia, and is attributed to the influential contributions of functional linguists such as Martin (1984), Halliday (1985), Halliday & Matthiessen (2004), and Christie & Derewianka (2008), among others. In alignment with the sociocultural theory of language, this approach encourages educators to experiment with innovative approaches beyond simple vocabulary and grammar instruction that underscores the importance of improvisation in teaching (Lantolf & Poehner, 2014). Hyland (2004) and Burns (2009) emphasize the importance of understanding how texts are structured and how they serve their communicative purposes by highlighting the importance of consciousness-raising in language learning.

Theoretically, genre-based pedagogy is rooted in systemic functional linguistics (SFL) and sociocultural and cognitive frameworks such as cognitive-genre and discourse-competence models, which view writing as situated social practice (Bruce, 2013). These frameworks emphasize that genres are not merely textual forms but cognitive schemas and social tools (Christie, 1999). Genre teaching, therefore, scaffolds learners' metacognitive awareness and rhetorical choices, fostering both analytical thinking and discourse competence (Negretti & Kuteeva, 2011; Bruce, 2013). However, while genre pedagogy has been well-theorized, its integration with emerging immersive technologies lacks strong theoretical justification in the literature.

The Sydney school of genre emphasizes the importance of genre as a 'means of making choices' in creating meaning (Christie, 1999). Moreover, genres can be viewed as social processes in which social structures influence genres' selection, combination, and interaction within a specific context (Kress, 1999). Rothery (1996), one of the pioneers in cyclical teaching

and learning, suggests that GBA is very effective in promoting writing development since it helps students understand the purpose and structure of different genres, enabling them to produce texts that adhere to the expectations of the genre.

The domains of human experience and social identities are enacted in the texts for a reason that serves specific purposes; nonetheless, texts conceal these meanings (Martin, 1984). Thus, mastering particular writing genres is crucial for active and meaningful participation in social contexts. Martin (1992, 1994) states that GBA improves writing development by providing students with specific strategies for each genre. Accordingly, a line of studies implemented to enhance the ability of the learners to handle diverse writing tasks is provided as follows.

Rose (2003) demonstrated that GBA contributes to writing development by emphasizing the social context in which genres are used. As a result, students understand genre conventions and social functions, resulting in more authentic and effective writing. Christie and Derewianka (2008) stated that GBA facilitates writing development by fostering critical thinking and analytical skills in teaching and learning cycles. Accordingly, students gain a greater understanding of rhetorical choices and intricate textual structures by analyzing and deconstructing genres. Burns (2009) implemented GBA for speaking and writing abilities by focusing on consciousness-raising of schematic structure, field knowledge, social functions, and linguistic features to the learners. Jodairi Pineh et al. (2017) investigated the application of this approach in the EFL context and reported the gradual disappearance of unconventional structures after consciousness-raising in GBA. Negretti and McGrath (2018) employed a scaffolded approach to genre knowledge within the context of an L2 doctoral research writing course, integrating insights drawn from metacognitive theory. Negretti (2021) examined the implementation of GBA for doctoral candidates specializing in the disciplines of science and engineering with a specific emphasis on metacognitive generalities in academic writing to advance students' comprehension of disciplinary genres and elevate the learners' aptitude in written expressions. Almacıoğlu and Okan (2018) explored genre-based pedagogy and its role in cultivating English Language and Literature students' metacognitive genre-awareness to enhance academic writing skills. Their findings show that most students developed declarative metacognitive awareness and demonstrated notable improvements in writing performance. Poonpon et al. (2022) implemented task-based learning with GBA among Thai students and concluded a successful combination for improving English proficiency. The investigations conducted by Allen and Paesani (2022) utilized GBA in conjunction with metacognitive awareness for studying English. Accordingly, the literature prevails noteworthy exemplars of the successful implementation of this potent pedagogical approach and strategies to handle different writing tasks. In addition, Zhai & Razali (2023) in a meta-analysis over thirty years of the application of GBA, concluded it to be approved and practiced worldwide highlighting its potential with other approaches. However, despite these advancements, there remains a significant gap in the literature regarding the application of consciousness-raising in GBA through VR.

E-learning has also been instrumental in English academic writing. For example, Xing et al. (2008) studied how e-learning enhances cultural awareness and English academic writing for overseas students by comparing Chinese and English rhetoric. While digital tools like e-learning platforms have proven effective, newer immersive technologies such as virtual reality (VR) are now expanding the possibilities for language education.

VR in language education is underpinned by theories of immersive learning and cognitive-affective engagement—premised on the sense of presence and spatial embodied cognition (Sherman & Craig, 2003; Dalton & Devitt, 2016). Meta-analyses of VR in language learning show significant gains in motivation, vocabulary retention, anxiety reduction, and learner engagement, but most focus on oral and aural skills rather than writing (Lin & Lan, 2015; Chen et al., 2022). Limited studies on VR-assisted L2 writing primarily explore descriptive tasks, but fall short of linking immersive experiences with genre consciousness-raising and metacognitive development.

While much VR-assisted language research emphasizes oral and aural modalities, L2 writing remains underexplored. Existing studies on writing within VR have centered on descriptive tasks, e.g. labeling virtual scenes or narrative descriptions but seldom connect these activities to higher-order competencies such as genre awareness, rhetorical structure, or metacognitive reflection. To redress this gap, future interventions should intentionally integrate genre scaffolding and reflection cycles into immersive environments: for instance, prompting learners to observe authentic genre elements, map rhetorical moves, draft within context, and revise with structured peer feedback. Embedding such reflective sequencing could align embodied presence with metacognitive development, enabling students not only to write *about* VR contexts, but to *write through* them with genre-conscious sophistication.

While most pedagogic strategies have been extensively discussed in the literature, the intersection of virtual reality (VR) and Genre-Based Approach (GBA) remains largely uncharted. This untapped potential presents an opportunity to develop innovative dimensions for genre learning using immersive virtual environments. This lack of research invites future studies to investigate how VR can be integrated into GBA to enrich students' learning and engagement further in bringing consciousness-raising and metacognition.

Therefore, this article explores genre, textual organization, and language feature progression after consciousness-raising by the technology of VR in the 'deconstruction' or modeling stage in a genre teaching course. To check whether the findings were accurate, they were compared with the learners' impressions of the course and the experts' feedback on the pre-test and post-test texts. Accordingly, the following research questions are posited:

1) To what extent do the Iranian learners deploy appropriate generic macro structures in their texts after the implementation of genre teaching through virtual reality modeling?

2) To what extent do the micro-linguistic features for meaning-packing, such as lexical density, nominalization, and embedding structures, develop after the teaching and learning cycle?

3) What are the learners' perspectives and the experts' feedback on the impact of consciousness-raising of genre teaching courses through virtual reality?

3. Method

3.1 Context of the Study

This qualitative study was conducted at the University of Zanjan with the cooperation of Allameh Tabataba'i University. This qualitative study follows a multiple case study design (Stake, 1995), grounded in the genre-based pedagogy framework of the Sydney school and informed by Systemic Functional Linguistics (SFL). It also integrates phenomenological insights, as it seeks to understand participants' lived experiences with virtual reality–enhanced genre instruction. The study utilizes content analysis to investigate both macro and micro discourse features in participants' pre- and post-test writing. Six EFL learners participated as embedded cases to explore language development through a teaching and learning cycle.

As one of the elemental genres, Information Report (IR) was designed in VR for the learners. The software Unity Engine as the interface of the HTC Vive headset created the virtual world using the computer language C#. The teacher's voice accompanied the learners in VR at the modeling stage of the cycle. Six learners participated in this study. Consecutively and purposively, three pairs were assigned to gain in-depth insight into the learners' experiences and language development. Table 3.1 provides the demographics of the study.

Table 3.1

Demographics

Name/Alias	Age	Gender	Degree	Major/ Grade	University / College
Omid	38	M	MS	Chemical and Petroleum Engineering	Sharif University of Technology, Tehran, Iran
Elham	32	F	BA	Business Management	University of Zanjan, Iran
Hanieh	27	F	Internship	Medicine	Zanjan University of Medical Sciences, Iran
Taha	16	M	Student	Engineering Facilities	Martyr Morteza Motahari Vocational High School, Zanjan, Iran
Mohammad	16	M	Student	K 8	Exceptional Talents High School of Shahid Beheshti, District 1, Zanjan, Iran
Parsa	16	M	Student	K 8	Exceptional Talents High School of Shahid Beheshti, District 1, Zanjan, Iran

3.2 Data Analysis Procedures

The analyses encompassed two interrelated macro-feature and micro-feature analyses, in addition to the learners' and experts' feedback. Considering the macro features analysis, the independently constructed texts of the learners were analyzed based on the conformity and non-conformity to the IR genre recognized by the Sydney genre school in the texts. Regarding the micro-feature analysis, the analysis was narrowed down to those interrelated meaning-packing features in the written texts (Derewianka, 1991, 1999). The process of the tagging and the calculation of the lexical density (LD) was based on Halliday's formula (1985) for LD. In addition, for the other micro feature, Halliday's grammatical metaphor categorization (1998) was used for the detection and classification of the nominalized instances in the learners' texts. Finally, the participants' impressions through semi-structured interviews and the experts' feedback on the pre-test and post-test texts were incorporated and elaborated in the results section of this study.

To ensure the trustworthiness of the study, following Lincoln and Guba (1985) multiple strategies were adopted. Triangulation was used by analyzing three types of data: learner texts, interview responses, and expert evaluations. Member checking occurred when participants reviewed their interview transcripts and confirmed the accuracy of their reported experiences. Peer debriefing was employed by involving multiple expert reviewers in genre pedagogy to evaluate the learners' texts. Thick description was provided to describe the learning context and pedagogical process in detail, enhancing transferability. Finally, a clear audit trail was maintained for the analytical procedures, including lexical tagging, clause segmentation, and nominalization coding.

Table 3.2

The overall qualitative design of the study summarized

Aspect	Description
Qualitative Typology	Case Study (Stake, 1995) + Phenomenological elements
Theoretical Framework	Genre-Based Pedagogy (Sydney School), Systemic Functional Linguistics (SFL)
Data Sources	Pre/post writing samples, interviews, expert feedback
Analytical Approaches	Content analysis, lexical density, grammatical metaphor
Rigor Strategies	Triangulation, member checking, peer review, thick description

3.3 Cycle of Teaching and Learning

In alignment with Hyland's (2004) genre-based teaching and learning cycle, the instructional procedure in this study was systematically organized into five progressive stages: setting the context, deconstruction (modeling), joint construction, independent construction, and comparing. Each stage was carefully designed to scaffold learners' understanding and production of the Information Report (IR) genre, with the integration of Virtual Reality (VR) as a consciousness-raising tool during the modeling phase.

In the adopted teaching and learning cycle (Hyland, 2004), the first stage was setting the context and letting the learners know the field of the context. As a result, participants were asked to attend a pre-test session before any particular teaching and learning activity. Following the documentation of the learners' consent, they were presented with the following task during the pre-test session: 'Write an essay about the importance of the water cycle in life.' The pre-test session was conducted due to the absence of a control group, as other aspects of the impact could not be studied.

The VR version used in this study demonstrated an anatomical human body standing in the center of the world. Accompanying the real voice of the teacher, the learners could teleport inside a virtual eukaryotic cell to learn the content (What), and the way this type of text is constructed (How/Why) to achieve its intended purpose in the English language. In other words, the VR design allowed for exemplifying how IR texts unfold to fulfill their communicative goals in the process of meaning-making.

The second stage, deconstruction (modeling), started in this way, and different functional stages of the IR prototype text were instructed in addition to the content. According to Derewianka (1991, p. 53), among the three moves or functional stages of this kind of text, the introduction part contains three steps: 'general opening statement,' 'general classification,' and 'locating the topic'. Likewise, after elaborating on the functional stage of the introduction, the body of the IR prototype text was demonstrated to the learners in VR. That is to say, after entering into the cell when touching each body part of the cell, the paragraphs popped out explaining the mitochondrion, golgi, and nucleus in the following steps: topic sentences ^ and supporting sentences. Finally, by getting out of the cell, the conclusion texts were demonstrated to the learners according to the final move of the conclusion: a general statement to round off ^ the writer's opinions (Derewianka, 1991).

Within this VR modeling stage, the emphasis was only on the macro features of the text, such as the introduction, body, and conclusion. These demonstrations helped learners understand the genre's existence and its specific and generic features. In harmony, learners were instructed to analyze the genre to identify the stages and the critical characteristics of the authentic texts and the related texts incorporated in the VR and out of it in the class. Accordingly, the course aimed to enhance students' awareness of how IR is structured in the English language and how its intended purpose is achieved (Hyland, 2006).

The third stage of joint construction was applied orally and written in the class. This stage allowed the learners to discuss and produce different parts of the prototype text with the help of the teacher and the pair. The minimized feedback received from the teacher in this stage compared to the former scaffolded the learners into a complete draft production, enabling the teacher and learners to collaborate within similar text types.

In the fourth stage, the learners navigated the different text parts by themselves and produced several independent written texts in the post-test session. The final stage of the cycle involved connecting the knowledge acquired by the learners to other genres and contexts. This stage is called 'comparing' in the Hyland model (2004). In this stage, instructors would mainly

assist learners by presenting related topics within the same genre or exploring similar topics in different genres, such as discussion, exposition, and narration. The overview of the procedure of the cycle implemented in the study with its language-culture-based orientation is depicted in the following Figure 3.1.

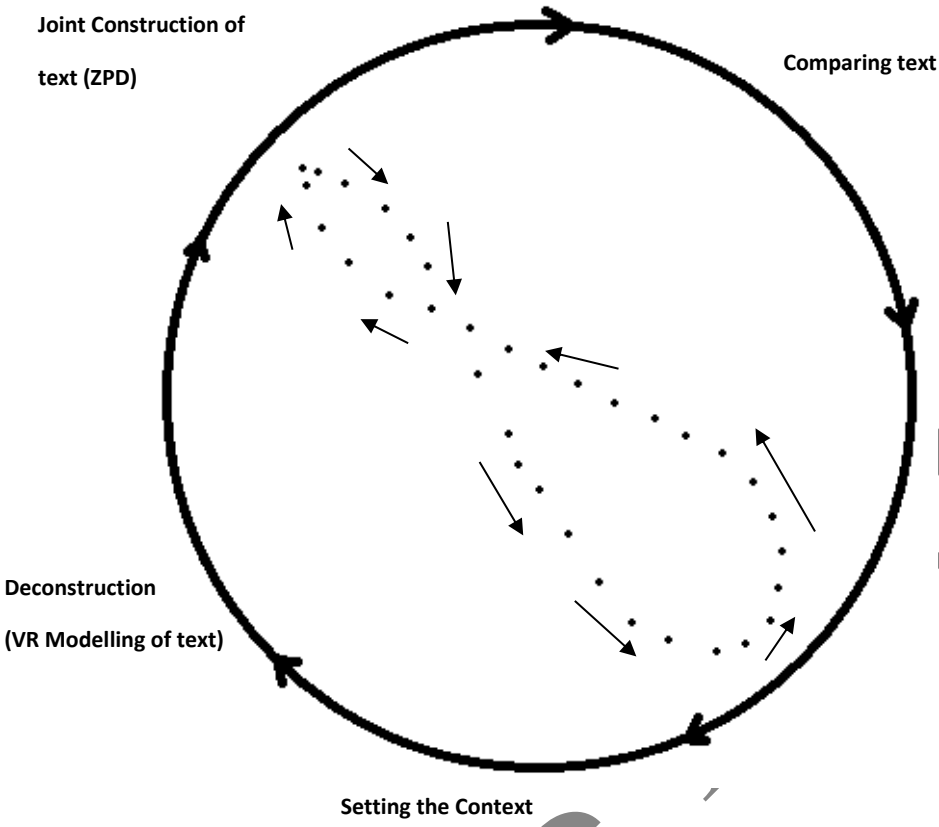

Figure 3.1. Cycle of teaching and learning through virtual reality.

4. Results

4.1 Macro Features Analysis

In the analysis of the learners' pre-test texts, the pre-test texts were outside the conventions of the prototype IR text identified by the Sydney genre school. Four of the pre-test texts started by giving details in the text rather than the introductory stage. This unknown macro feature was named 'cold open,' which was against the conventions of the Sydney genre school for this genre. All the pre-test texts were analyzed and classified as a 'non-conformity' feature. The following example text is Hanieh's pre-test text:

***At first** whole surface of the planet was covered by water, then some* خشکی ها* *appeared.*

Water is the most important solution of life 2/3 of the human body consists of water.

Water of the sea and oseans becomes to بخار هوا* *by the radiation of sun then fall to the earth agin as the rain.*

There are a lot of چشمه های آب زیر زمینی* *that are so important for recycling of water of planet cleansing* تمیزی* *of the water so important for eccosystemes.*

*Equivalents in English: dry-out lands; air vapor; under-ground water springs; purity.

As observed, the text has many grammatical errors, and recognizing different text parts is difficult. The writer has used Farsi words, which exemplifies a need for more proficiency in English. Accordingly, this text was considered non-conform to the IR text type. Similarly, Taha's, Mohammad's, and Elham's texts, with many grammatical errors, respectively followed similar openings. Taha started his first independently constructed text in the pre-test session text by stating that "ferst rain com from skay," Mohammad by stating that "at first cloud changes to water," and likewise, Elham, by commencing that "the sun shines in

the water." Accordingly, the participants jump-started by giving the details instead of locating the topic and classifying the topic and subtopics anticipated for the introduction part or first move.

Similarly, the learners' post-test texts were analyzed against the Sydney genre school conventions. The objective was to identify any changes after the genre teaching courses. The analysis of the post-test texts at the macro level revealed that most of the post-test texts comply with the generic structures of the information report in the English language. Different functional stages of introduction, body, and conclusion were identifiable, and Hanieh, Omid, Elham, and Taha successfully produced conformity to this genre. The following is Hanieh's post-test text.

The water cycle is like a big circle which is happen when the water molecules turn into vapour and back to the earth as rain, snow, or hailstones. It containes 4 stages i.e. evaporation, condensation, precipitation, and run off.

When the sun shines, water of the ocean and lakes changes to the water vapour. This process is called evaporation. When the molecules of water evaporates, they goes up into the atmosphere.

*This water vapour get's together and turns into a cloud which is called condensation.*when the weather become colder the clouds get dense and they drop the water back to earth in some form of precipitation such as rain, snow, hail or sleet. At this stage again water join the rivers, lakes and oceans and water cycle continioues.

The importance of water cycle cannot be denied. We cannot live without fresh water. 2/3 of the human body composed of water. It creats the availability of water for all living organism and regulates weather of our planet.

Compared to her pre-test text, the analysis of the macro features in the post-test text revealed that this text started with a general opening statement defining the 'water cycle' and correctly located the topic to be discussed by general classifications. The body of the text unfolded with a topic sentence followed by a supporting sentence. In the conclusion, the author utilized a general statement to conclude and prepare the readers for the final wrap-up section. Accordingly, Hanieh met the basic requirements of the IR genre, and her text was considered as conformity to the IR genre.

Among the post-test texts, only Mohammad's and Parsa's texts were considered non-conformities to the genre. Despite some progressions in their writing, the functional stages were not similar to the prototype information report genre. The following example is Parsa's produced text in the post-test session.

First of all what is the water cycle?

The water cycle is accompanied with three essentials: Evaporation, compression and rain.Water effects the intensity of diversity and climate change on earth.

The water cycle is an essential part of accidents like dearth and flood.

Human use water for drinking, farming, water energy, fresh disposal, etc. therefor protecting the water is important for human use and the Ecosystems health.

In many areas due to population growth and pollution, water is decreasing.

In the end the water cycle values because it provides drinkable water for all living creatures.

Although this text has been classified as non-conformity to the prototype text, there are meaning-making developments in the construction of this text compared to its scratch-point. The text's subtopics in topic sentences were to be unfolded by supporting sentences related to the value of the water cycle and were much more organized in the post-test texts. Progressions were observed in the rest of the learners who developed information reports. The following is Omid's post-test text.

The water cycle is the continuous movement of water on, above and below the surface of the earth. It makes water available for living organisms and other important activities.

The life of all living organisms depend on water. All human beings, animals and plants would die without water.

No important activity can be done without water, water is essential for agriculture, energy, industry and environment.

As a **result**, *the value of water cycle is unmeasurable*. If water don't naturally recycle itself, we will run out of clean water and our extinction will be inevitable.

The overall macro analysis revealed that only two learners out of six were partially successful in deploying generic features compatible with the genre. However, meaning-making improvement was observed in their post-test texts, along with other language features. Table 4.1 compares conformity and non-conformity structures in pre-test and post-test texts, where 'C ' stands for conformity to the genre. Non-conformity is shown by 'NC'.

Table 4.1

Macro Analysis: Conformity and Non-conformity Structures

Name	Pretest	Posttest
Omid	NC	C
Elham	NC	C
Hanieh	NC	C
Taha	NC	C
Mohammad	NC	NC
Parsa	NC	NC

4.2 Micro Feature Analysis

Lexical density (LD) and nominalization as two known micro language features accountable for the meaning packing in academic texts were analyzed in the texts (Halliday & Matthiessen, 2004; Derewianka, 1991; Jodairi Pineh, 2022). The calculations of the LD were based on the Halliday formula (1985, 1989). For the calculation of LD, lexical items, including the four main classes of words, were tagged (e.g., noun, verb, adjective), grammatical or functional items such as articles, prepositions, auxiliary finite verbs (e.g., be, was, can), some types of adverbs, and relators (conjunctions) were excluded in order to find the lexical items in the texts. The clause boundaries of relations, including hypotactic, paratactic, and non-defining clauses, were specified and counted. The LD of the texts was reached by dividing the number of lexical items by the number of clauses according to Halliday's formula (1985). It is worth noting that this type-token ratio is calculated in traditional LD (Ure, 1971) by dividing the lexical items by the total word number multiplied by 100. However, Halliday (1985) argues that meaning is packed in clause units, not words. In this way, here is Halliday's formula for lexical density: Number of lexical items/Number of clauses

Table 4.2 depicts a micro-level analysis of Omid's pre-test text. As it is noticeable, the lexical items within the seven clauses in this text are: Every, thing, depend, water, resources, human, beings, life, animals, exists, water, actually, bodies, containers, mainly, filled, water, water, cycle, result, makes, living, possible, nothing, ruler, tool, measure, value, water, cycle, life, unmeasurable, thing, matters, exists, water, cycle.

Accordingly, 36 lexical items divided by seven clauses equals 5.14 with the Halliday model and 59 % with the Ure model. To et al. (2013) argue that Halliday's model is more readable and accurate.

Table 4.2

Micro Language Feature Analysis

Text

Every thing depends on **water resources**. **||Human beings, life**, **animals,** etc **exists** because of **water||**. **Actually,** our **bodies** are like **containers** [[**mainly filled** with **water**]]||. **Water cycle** as a **result**, **makes living possible** ||. So, there is **nothing**,no **ruler**, no **tool** [[to **measure** the **value** of **water cycle** in **life**]]||**.** It is **unmeasurable** ||. No **thing matters**/**exists** without the **water cycle**||.

Words: 61	Lexical Density (Halliday): 36/7: 5.1	Embedding [[ ]]: 2
Lexical item: 36	Lexical Density (Ure): 36/61*100: 59 %	Nominalization: 13/61: 0.213
Clause ||:7		

The sign || identifies the clause boundaries of relation: hypotactic, paratactic, and non-defining relative. The clause boundaries specified in Table 4.2 partially resemble traditional grammar's subordinating and coordinating conjunctions. However, they must be interpreted based on the grammatics of the SFL, as it primarily focuses on meaning rather than strict grammar structures. Similarly, all the pre-test and post-test texts were analyzed at the micro level analysis. Table 4.3 depicts the results from the study of the learners' texts regarding lexical density.

Table 4.3

Micro Feature Analysis: Lexical Density (Halliday & Ure)

Name	Stage	Word	Clause	Lexical items	LD Ure	LD Halliday
Omid	Pre-test	61	7	36	59 %	5.1
	Posttest	94	9	52	55 %	5.7
Elham	Pretest	21	5	13	61 %	2.6
	Posttest	188	20	105	55 %	5.2
Hanieh	Pretest	85	8	35	41 %	4.4
	Posttest	167	15	88	52 %	5.8
Taha	Pretest	37	6	18	48 %	3
	Posttest	147	17	72	50 %	4.2
Mohammad	Pre-test	36	6	11	30 %	1.8
	Posttest	108	15	52	48 %	3.4
Parsa	Pretest	61	8	33	54 %	4.1
	Posttest	96	10	57	59 %	5.7

As can be seen, and as relied on the Halliday model in the calculation, the LD in the learners' texts has increased compared to the first drafts. Changes in some learners' writings are high, while some are low. For example, it has highly increased in Elham's, Hanieh's, and Parsa's texts from 2.6, 4.4, and 4.1 in the pre-test to 5.2, 5.8, and 5.7 in the post-test texts, respectively. However, the changes in the LD of Omid's text and Taha's text do not show significant differences. Figure 4.1 compares the LD in the texts before and after the implementation.

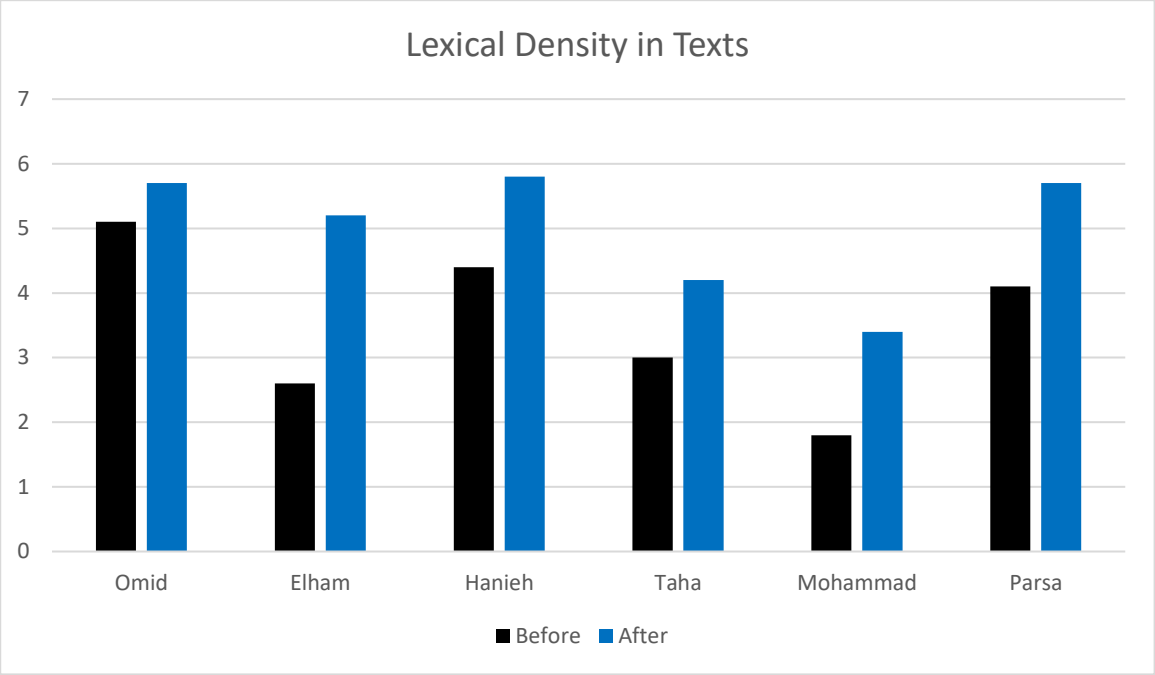

Figure 4.1. Lexical density in pre-test and post-test texts.

According to Halliday's (1998) categorization of grammatical metaphor (GM), the other meaning-packing micro feature, nominalization, was analyzed in the corpora. It is worth noting that in SFL, GM is a source of new consciousness from the higher stratum available for the writer (Halliday & Matthiessen, 2004). Nominalization as the central GM resource in the pre-selection process being detected was used for a finer analysis. According to Ravelly (1999), the four common types of nominalization with the grammatical class shift from the congruent to metaphorical structures rank-shifted in the English language from the process, quality, circumstances, and the relators. The texts were analyzed based on their probable congruent agnates when looking for conscious choices in the lexicogrammar in the learners' pre-test and post-test texts.

Nominalization in the post-test texts increased. For example, movement of water, evaporation, condensation, survival, conversion of water vapor, the possibility of survival, and pollution are derived from a process to a thing in their class shift. Other examples from the learners' texts, such as 'disposal' have derived from quality to a thing, or 'as a result' has shifted rank from clause level to group level from relator to noun. Similarly, all the texts were scrutinized for the GM, which increased in post-test texts. Figure 4.2 depicts the overall change with four common types of nominalization.

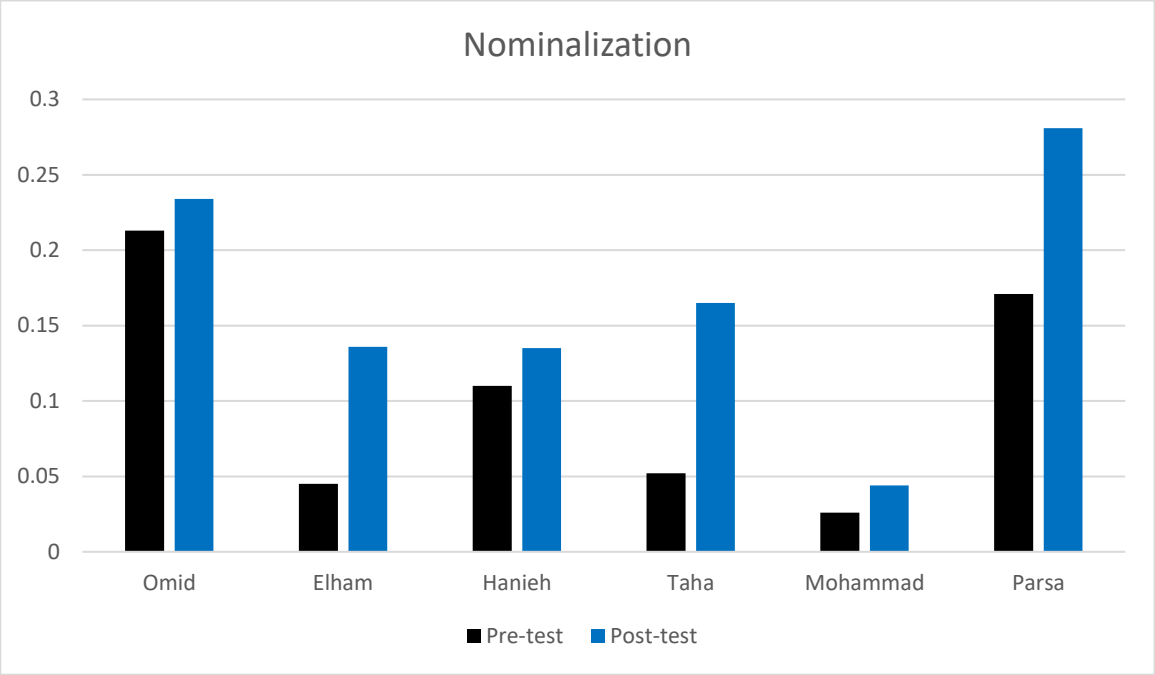

Figure 4.2 Nominalization in pre-test and post-test texts.

Table 4.4 reports the statistical tallying of these features responsible for meaning-making potential (Derewianka, 1999).

Table 4.4

Meaning Packing: Conscious Choices in the Lexicogrammar

Name	Stage	Lexical Density	Nominalization	Embedding
Omid	Pre-test	5.1	0.213	2
	Posttest	5.7	0.234	2
Elham	Pretest	2.6	0.045	0
	Posttest	5.2	0.136	6
Hanieh	Pretest	4.4	0.110	1
	Posttest	5.8	0.135	5
Taha	Pretest	3	0.052	1
	Posttest	4.2	0.165	3
Mohammad	Pre-test	1.8	0.026	0
	Posttest	3.4	0.044	2

Parsa	Pretest	4.1	0.171	2
	Posttest	5.7	0.281	1

Regarding the progression, Cohen's way of quantifying qualitative measures (1988) showed that Parsa's, Elham's, and Taha's post-test texts have 39, 66, and 68 percent progression in nominalization compared to the pre-test texts. The progressions are calculated by subtracting the pre-value from the post-value, dividing it by the max value, and multiplying it by 100 to get the percentage (Cohen, 1988). Table 4.5 depicts the progressions in the texts after the implementation.

Table 4.5

Meaning-packing Progression in the Texts

Name	Lexical density	Nominalization
Omid	10 %	9 %
Elham	50 %	67 %
Hanieh	24 %	18 %
Taha	28 %	68 %
Mohammad	47 %	40 %
Parsa	28 %	39 %
Overall	31 %	40 %

Derewianka (2003, 1991) elaborated that lexical density, nominalization, embedding, and noun grouping are some of the main conscious micro features responsible for meaning-packing ability in the learners' written texts. Embedding occurs when a clause acts in the constitution of another clause that modifies the subject or object of the main clause (Halliday & Matthiessen, 2004). Table 4.4 demonstrates the embedding structure fluctuation as another responsible meaning-packing feature in the learners' texts. However, due to low instances, embedding structures and noun grouping could not be further explored.

This study analyzed the texts as a means of communication through the lens of SFL. Consciousness-raising about the macro structures of the text through VR was implemented in a genre teaching course aimed at developing the academic writing of six volunteered Persian EFL writers. Hyland's (2004) cyclical way of teaching and learning was adopted for class activity. The 'modeling' or 'deconstruction' stage was powered in a VR atmosphere, as defined in the methodology section. The overall results of the analysis after the teaching and learning cycles indicated some improvements in the learners' texts.

4.3 Analysis of Feedback from the Learners and Experts

The general themes were conducted using semi-structured interviews with a general framework within which the interviewer urges exploration. Accordingly, six writers whose texts were analyzed in this study were interviewed. After the interview, the participants were asked to fill out a questionnaire with the same questions asked during the interview to document their feedback. A significant theme of questions revolved around the three zones before, during, and after the implementation. The overall results of the interviews, based on the participants' answer sheets, were positive. For example, a participant stated that he got involved in the learning process and that the knowledge he acquired could result in more transparent and effective communication. Here is an excerpt from his answers to the interview questions.

Before taking the sessions, I had no vivid idea.
While taking the sessions, I started to know the environment little by little. I got really involved in the learning process.
I think I am really aware of the stages of academic writing.
Subsequently, better communication results in the attainment of better positions.

AVR technology hardware can lead to a better learning experience.

Another participant stated that she needed to learn how to draft a scientific text before the sessions. Below is an extract from her interview.

I thought it would be difficult, but I learned the teaching method and concepts very quickly.

You will learn more deeply, although it may take a little more time.

In every job and social position, there is a need to know how to write in order to introduce a resume, read and publish an article and achieve a better job position.

The opinions of the other participants were also positive. For the trustworthiness of the findings, the texts were sent to four experts in the field. The selection of the experts was based on the number of publications in genre teaching (Zhai & Razali, 2023) to obtain the experts' opinions on the pre-test and post-test texts. Accordingly, the data, including the drafts, was emailed to a panel of experts in genre teaching: Professor Ken Hyland, Professor Aiyoub Jodairi Pineh, Professor Rafaella Negretti, and Professor Beverley Derewianka.

Professor Derewianka's response to the learners' texts was incorporated into the study, as well as Jodairi Pineh's elaboration on the focus of the study_ virtual 'deconstruction' and going against the grain in the teaching and learning cycle. Intermingled into the work, the study adopted a cycle based on the Hyland model of teaching and learning (2004). The study hopefully received positive feedback from two of the experts in the panel; the following text is Professor Derewianka's feedback on the texts before and after the genre teaching course: "On the whole, the difference between the first and second drafts is quite impressive. I think it would be very useful to document how such improvements were made and to publish your findings in a professional journal to share with colleagues" (Personal E-mail Communication, December 2023).

Discussion

In response to the first research question, it was seen that the macro features responsible for reporting information were developed and conformed to the prototype text after the pedagogy. While there was no prototype genre in the pre-test session, this number increased to four out of six learners in the post-test. This positive result corresponds to some studies in EFL contexts. For example, Huang & Jun Zhang's (2020) findings confirm that the genre approach helps students improve content and organization. Likewise, Negretti and Kuteeva (2011), Almacıoğlu and Okan (2018), Allen & Paesani's (2022), and Negretti & McGrath (2018) studies on genre-based approach and metacognitive awareness for studying English and literature are all successful reports of this pedagogy's application around the world (Zhai, Razalli, 2023).

Therefore, this pedagogy has also been helpful in consciousness-raising for deploying interrelated macro and micro language features, and it is in contrast to the traditional approaches, which revolve mainly around language aptitude, neglecting the culture. On the other hand, positive reports on the application of technologies, such as augmented-virtual reality, multimodal text comprehension, and artificial intelligence use in teaching language components, support the benefit of VR in genre teaching (Marougkas et al., 2022; Fernandez, 2017; Daly & Unsworth, 2011; Miller & Dousay, 2015). However, analysis of the learners' post-test texts revealed that there are still problems regarding grammatical errors, theme, and rheme structures. Notably, learners initially employed an unfamiliar rhetorical feature in their pre-test texts—a phenomenon documented in EFL writing literature under various terms. Xing et al. (2008) labeled it "circularity" or "topic shift," while Jodairi Pineh (2017) termed it a "cyclical approach." Strikingly, this feature disappeared entirely in the post-test texts, suggesting pedagogical intervention successfully addressed it.

Regarding the micro-level analysis to answer the second research question on meaning-packing ability, three responsible micro features (Derewianka, 1991, 1999; Burns et al., 1996) were studied and selected for analysis. The lexical density and nominalization have been improved in the corpora, suggesting that the learners have grown in their ability to pack more meaning into written texts after the pedagogy as a conscious feature of academic written texts; attic way of rhetoric (Halliday, 1985; Martin, 1993).

The improvement in lexical density and grammatical metaphor observed in the texts after the pedagogy reflects growth in meaning-packing ability with clause and clause complexes, aligning with Halliday's conceptualization of nominalization as a

hallmark of academic discourse—a product of the "pre-selection process at the higher stratum available to the speaker or writer" (1985, p. 102).

The improvements in lexical density and grammatical metaphor were instantiations of meaning-packing as an essential characteristic of academic texts. However, low instances of other features like 'noun grouping' and 'embedding' were insignificant due to the small sample size. In the learners' texts, the investigation uncovered a transition towards the concept of 'thingness' (Halliday, 1985) in the post-test texts. This progression of nominalization, from a process-based orientation to a thing-based one, was the top conscious choice of the participants after the implementation. This strategic preference for nominalization emerged as the participants' most salient metacognitive adaptation post-intervention, despite the absence of explicit microlanguage instruction.

Regarding the third research question, the interviews' results, when used to assess the feedback from the participants and the panel of experts, revealed satisfaction with the implementation. Both learners' self-reported experiences and expert assessments affirmed measurable advancements in macro-structural coherence and micro-linguistic precision, underscoring the role of VR as a consciousness-raising mechanism within the genre-based teaching cycle.

Conclusion

The study sought to determine the possible potential of VR technology in genre teaching, that is, as a consciousness-raising technique, with six volunteer Iranian academic writers. Compared to the pre-test texts, the post-test texts witnessed a much-improved ability in genre control, accompanied by experts' and learners' judgments.

It might be argued and postulated that VR and GBA could be applied with the potential to expand consciousness-raising resources to enable EFL writers to deploy macro/micro language resources. The claim is supported by this study's findings in that while there were no familiar prototype genres in the pre-test texts, the post-test texts increased to four out of six. In micro features, two of the micro language features responsible for packing information in written texts indicated higher lexical density proportion and a higher frequency of nominalization. As a result of the triangulation of the data collected from the macro and micro feature analysis by the Sydney genre conventions, the impressions provided by the learners via interviews, and the feedback from the experts, respectively, it is possible to conclude that VR helped in bringing a consciousness-raising into genre teaching.

This study has several limitations that could have affected the results. The first pertains to the judgmental sampling and the number of learners participating in the study who were motivated to improve their writing proficiency. Consequently, the findings may not represent a broader population of learners in different contexts. Larger sample sizes and facilities are needed for any generalization. The second limitation was the time-consuming process of ordering the codes for the desired VR platforms. Automated code generation tools or platforms tailored to VR development could simplify and expedite the process. Finally, ongoing human invigilation had to be done to maintain the available consistency in the analysis, based on what Halliday (1985, p. 63) reiterates, as "it does not matter exactly where we draw the line provided we do it consistently". It is suggested that SFL-powered analytics and monitoring tools be used to support teachers in tracking performance and consistency in analysis. In other words, free tools for data analysis, such as the UAM Corpus Tool and Sysfan, would minimize human error and enhance objectivity.

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Data Availability

The data of the study is available upon reasonable request.

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