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YILDIZ TECHNICAL UNIVERSITY
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DEPARTMENT OF COMMUNICATION AND DESIGN
MA PROGRAM IN INTERACTIVE MEDIA DESIGN

MASTER'S THESIS

COMICS VS. INTERACTIVE COMICS: A COMPARATIVE STUDY ON ENHANCING DESIGN STUDENTS' ENGLISH READING SKILLS AND LEARNING EXPERIENCES

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2024

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Meral ŞENTÜRK tarafından hazırlanan “Comics vs. Interactive Comics: A Comparative Study on Enhancing Design Students’ English Reading Skills and Learning Experiences” başlıklı çalışma, **7/Haziran/2024** tarihinde yapılan savunma sınavı sonucunda [**oybirliği**/oycokluğu] ile başarılı bulunmuş ve jürimiz tarafından İletişim ve Tasarımı Ana Bilim Dalı İnteraktif Medya Tasarımı Programında **YÜKSEK LİSANS** tezi olarak kabul edilmiştir.

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ABSTRACT

COMICS VS. INTERACTIVE COMICS: A COMPARATIVE STUDY ON ENHANCING DESIGN STUDENTS' ENGLISH READING SKILLS AND LEARNING EXPERIENCES

The proliferation of educational materials and resources in design education has witnessed a notable surge, owing to the evolving paradigm of education in the context of the global pandemic and the advancement of new technologies. However, there is a valid argument to be made regarding the relative lack of progress in the field of design when it comes to the development of professional English. While the field of design has grown and become increasingly complicated over the past few years, little has changed in terms of how English for Design is taught in countries where English is a foreign or second language. This study seeks to address the aforementioned shortcoming and make a valuable contribution to the existing literature in the domain. The researcher has developed multimodal educational materials that align with constructivist epistemological focus to English for Specific Purposes education, aiming to facilitate the acquisition of design terminology and enhance communication design students' reading skills and learning experiences. The researcher designed an open-source physical comic and its interactive version in Ren'Py visual novel engine. The study followed a sequential explanatory mixed-method design within a quasi-experimental framework to evaluate the comics. The study comprised of 20 communication design students enrolled in the ILT3931 English for Design course during the fall semester of 2023-2024 at Yildiz Technical University's Faculty of Art and Design, Department of Communication and Design. The study sought to investigate the impact of high-fidelity prototypes of teacher-made physical comic and its interactive comic version on communication design students' reading skills and learning experiences. By implementing three interventions, the study utilized a basic time-series framework to assess the effectiveness of the training materials.

The pre-test and post-test evaluations revealed positive results regarding the efficacy of the teacher-made comics. Concurrently, follow-up surveys yielded congruent insights into user experience and motivational aspects associated with the teacher-made comics. Furthermore, post-intervention focus group discussions with communication design students provided practical information on the design of teacher-made comics and areas for improvement, complementing the quantitative findings with qualitative data.

Keywords: English for specific purposes (ESP), English for design, interaction design, teacher-made comics, multimodality, constructivist approach.

ÖZET

ÇİZGİ ROMAN VE İNTERAKTİF ÇİZGİ ROMAN: TASARIM ÖĞRENCİLERİNİN İNGİLİZCE OKUMA BECERİLERİNİ VE ÖĞRENME DENEYİMLERİNİ GELİŞTİRMEYE YÖNELİK KARŞILAŞTIRMALI BİR ÇALIŞMA

Global pandemi bağlamında gelişen eğitim paradigması ve yeni teknolojilerin ilerlemesi, birçok eğitim alanında olduğu gibi tasarım alanında da eğitim materyallerinde ve kaynaklarında dikkate değer bir artış ve çeşitliliğe sebep olmuştur. Ancak mesleki İngilizcenin gelişiminde tasarım alanında nispeten az ilerleme olduğu konusunda öne sürülmesi gereken geçerli bir argüman vardır. Tasarım alanı son birkaç yılda büyüyüp giderek gelişirken, İngilizcenin yabancı veya ikinci dil olarak konuşulduğu ülkelerde Tasarım için İngilizce'nin öğretilme biçiminde pek bir değişiklik olmamıştır. Bu çalışma yukarıda bahsedilen eksikliği gidermeyi ve alandaki mevcut literatüre değerli bir katkı sağlamayı amaçlamaktadır. Araştırmacı, mesleki terminoloji öğrenimini kolaylaştırmayı ve iletişim tasarımı öğrencilerinin okuma becerilerini ve öğrenme deneyimlerini geliştirmeyi amaçlayan, Özel Amaçlı İngilizce eğitimine yapılandırmacı epistemolojik yaklaşım ile uyumlu çok modlu eğitim materyalleri geliştirmiştir. Bu bağlamda, açık kaynaklı bir çizgi roman ve onun Ren'Py görsel roman motoru kullanılarak oluşturulan interaktif versiyonu tasarlanmıştır. Çalışmada, yarı deneysel bir araştırma çerçevesinde sıralı açıklayıcı karma yöntem tasarımı takip edilerek çizgi romanlar değerlendirilmeye alınmıştır. Çalışma, Yıldız Teknik Üniversitesi Sanat ve Tasarım Fakültesi İletişim ve Tasarım Bölümü'nde öğrenim gören ve 2023–2024 Güz döneminde ILT3931 Tasarım için İngilizce dersini alan toplamda 20 tasarım öğrencisinden oluşan iki deneysel araştırma grubu üzerinde gerçekleştirilmiştir. Araştırma bağlamında, öğretmen yapımı fiziksel çizgi romanın ve onun interaktif versiyonunun yüksek ölçekli prototiplerinin tasarım öğrencilerinin okuma becerileri ve öğrenme deneyimi üzerindeki etkileri incelenmeye çalışılmıştır. Eğitim materyallerini değerlendirmek için temel zaman serileri kullanılarak toplamda üç eğitim gerçekleştirilmiştir.

Araştırma sonucunda, ön test-son test değerlendirmeleri, öğretmen tarafından oluşturulan çizgi romanların eğitsel başarısı açısından olumlu sonuçlar ortaya koymuştur. Eğitimlerin ardından uygulanan anketler, kullanıcı deneyimi ve materyallerle ilişkili motivasyon faktörleri hakkında karşılaştırılabilir bilgiler sağlamıştır. Öte yandan, odak grup tartışmaları sırasında tasarım öğrencilerinden gelen geri bildirimler, çizgi romanların tasarımı ve iyileştirilmesi gereken unsurları içeren önemli bilgilerin yanı sıra niceliksel sonuçları desteklenmesi ve tartışılmasını sağlayan niteliksel veriler de sunmuştur.

Anahtar Kelimeler: English for specific purposes (ESP), tasarım için İngilizce, etkileşim tasarımı, öğretmen yapımı çizgi roman, çok modluluk, yapılandırmacı yaklaşım.

FOREWORD

This work was influenced by the insights I acquired during my participation in the scientific preparatory program as a student who was admitted to this department from a different academic discipline. Comics played a pivotal role in my decision to pursue a career in this field. I have long envisioned that delving deeper into the realms of art and design would grant me a fresh perspective on the world of comics.

As an English teacher and philologist, I had the privilege of observing my undergraduate classmates. Based on my observations, I realized the importance of English competence in the field of communication design. This inspired me, prompting me to question whether or not I should be the one to do the task, since I was one of the only candidates who majored in English. My advisor, Asst. Prof. Dr. Umut Hocam, has continuously been a source of inspiration and unwavering support during my academic journey. Her unwavering guidance and unwavering belief in my abilities have propelled me to strive for excellence in all my pursuits. Whether it be in the classroom, during research projects, or in personal challenges, Umut hocam has always been there to provide valuable insights, constructive feedback, and words of encouragement. I am truly grateful for her mentorship and unwavering dedication to my success.

My co-advisor, Asst. Prof. Dr. Semin hocam, was not only my instructor in pedagogical formation, but also someone who understands the depths of my passion for comics and ESP and the profound impact they had on me. She encouraged me to explore new avenues in my research, pushing me to delve deeper into the intersection of comics and ESP. With her guidance, I was able to uncover unique insights and perspectives that I never thought possible. With immense gratitude to Umut and Semin hocam, who have an extraordinary level of empathy and faith in their students, we made a profound decision to begin working on the creation of comics.

ILT 3931 English for Design students who took part in the study showed a remarkable degree of commitment and focus in their involvement with the research. Their dedication and attentiveness were evident throughout the duration of the study, as they actively participated and provided valuable insights and data. Their willingness to engage with the research process and their consistent efforts to contribute positively were key factors in the success of the study. I would like to express my gratitude to each of them for their invaluable contributions.

I also want to extend my heartfelt gratitude to *Jamovi*, *Ren'Py*, *Comicgen*, *Taguette*, *RAWGraphs*, *Atom*, and *UEQ* creators for the incredible work they do. Their dedication to creating and maintaining these valuable tools has had a profound impact on my work. Their commitment to open-source principles not only fosters innovation but also empowers individuals like me to access powerful tools that would otherwise be out of reach. The collaborative spirit of the open-source community is truly inspiring, and I am grateful to be a part of it with my open-source educational comics.

In closing, I want to take a moment to extend my deepest gratitude to my incredible family. Throughout this challenging time, their support and understanding have been my rock. Their presence, filled with love, empathy, and unwavering care, has been a constant source of strength and comfort. I am truly blessed to have such amazing individuals by my side, and I cherish every moment spent with them. Their love and encouragement have helped me navigate through difficult times and celebrate the joys of life. From the bottom of my heart, thank you for being my family, my pillars of strength, and my greatest source of happiness (S&K&H&M&M). I am forever grateful.

Meral ŞENTÜRK

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LIST OF ABBREVATIONS

UX	: User Experience
EFL	: English as a Foreign Language
ESP	: English for Specific Purposes
ELT	: English Language Teaching
ESL	: English as a Second Language
CALL	: Computer-Aided Language Learning
CLT	: Cognitive Load Theory
EMI	: English Medium Instruction

1. INTRODUCTION

1.1. Introduction

This chapter provides a summary of the study's background along with a concise review of the current situation regarding the primary focus of the study, research problem, research questions, limitations, and significance of the study.

1.2. Background of the Study

The academic community has encountered a number of challenges in adjusting to the swiftly developing practices and approaches of the design industry. The field of design is itself dynamic and its language both polyvocal and full of contextual connotations. Several pieces of research have focused on bridging the divide between the industry and academia in the realm of design systems and concepts. One study highlights the "lack of coherence" between the academic and practical definition of the concept of design thinking (Carlgren et al., 2016). Considering the growing adoption of design systems, particularly in the field of user experience (UX), yet another study underlined the fact that there is also a significant shortage of knowledge regarding the inclusion of design systems in university curricula (Rose et al., 2022).

As the design industry is continually evolving, influenced by technological advancements, cultural shifts, and changing consumer demands, design departments need to adapt to these trends in order to remain relevant (Anngrianto, 2022; Getto et al., 2013; Yang & Hsu, 2017). This adaptability often leads to the inclusion of concepts and professionals from emerging fields, such as UX design, interaction design, game design or data visualization; thus adding to the eclectic nature of design departments (Chang & Lu, 2021; Moreira et al., 2016).

Given the profound impact that technological and industrial advancements have had on the design field, English language proficiency has grown in importance as it affords both design instructors and students access to a wealth of resources that can

aid them in their research, help them stay up to date on industry advancements, and assist in the identification of new trends. The majority of seminal works on design principles and terminology have originated in English-speaking countries, especially in the Western design tradition (Gelernter, 1994). Designers worldwide often use English-specific terms and concepts, making it easier to understand and implement design principles universally. Most of the prominent theorists in the field of interaction and communication design write and publish their work primarily in English. Engaging with literature, scholarly articles, online design platforms and magazines can serve as a catalyst for fresh ideas, ignite innovative thinking, and encourage designers to explore novel approaches. Being exposed to a diverse range of design content enables students to investigate various design strategies, trends, and emerging technologies, which they can then integrate into their own work.

English is widely regarded as the lingua franca of the business and creative industries (Jenkins, 2013). English proficiency allows designers to engage with and interact in international design communities, attend conferences, and participate in industry events where English is likely the primary language of communication. English also serves as a common language for design professionals from different backgrounds to collaborate, exchange ideas, and build networks (Mechlenbacer, 2009). By using a shared language, designers can overcome language barriers and work together more effectively. Mechlenbacher (2009) emphasizes the importance of diverse abilities in communication design due to rapid technological advancements and complex workplace challenges. He emphasizes the importance of being creative and lifelong learning to stay relevant in the evolving job market. There has also been a shift in the ontological and epistemological paradigms of design (Adams et al., 2013). According to Barbour et al. (2023), the rise in the number of design professions was mirrored by the growing interest in design as a topic, a philosophical approach, and a tool for research. Design projects often require collaborative efforts, involving professionals from different domains (Arias et al., 2000). This interdisciplinary approach brings together individuals with diverse skills, such as artists, engineers, marketing professionals, psychologists, and technologists, among others (Meyer & Norman, 2020).

This poses both opportunities and challenges for the implementation of “English for Design” courses and similar programs. The extensive use of English in

communication design education has implications for English for Specific Purposes (ESP) teaching and learning, as it provides prospects for linguistic authenticity and creativity. According to Basturkmen (2019), ESP teachers are entrusted with a diverse array of duties, many of which necessitate that they acquire additional knowledge and skills. As design is such a dynamic field, it presents considerable obstacles when it comes to the development and maintenance of related ESP programs.

Many studies have focused on the diversity and globalization of communication and design-related departments (e.g., Lee et al., 2021; Scherer, 2015). There has been a substantial amount of study conducted on communication education at the post-secondary level in Turkey. The purpose of these studies is to bring attention to issues that are currently being faced, even though their primary focus is on the hybridization and changes that are occurring within the faculty of communication (Kilic, 2023; Ozupek & Ozer, 2015; Tokgoz, 2003). On the other hand, studies that attempt to approach design education from a global perspective strive to investigate the cultural and linguistic challenges that international students face and try to provide solutions in the context of global design education (Bohemia, 2007; Brisco et al., 2019; Hall & Cheng, 2018; Lee et al., 2021; Macdonald & MacLeod, 2018; Radclyffe-Thomas, 2007). Although communication design is not exactly the focus of these studies (they are investigating similar programs such as graphic design, art and design, engineering design, architecture, and industrial design), the present study deems them useful as they provide students of communication design with insights into the future colleagues they will likely encounter in agile work environments and they have certain terminology and specs in common with one another.

Upon closer examination of these studies, we can attain a deeper comprehension of the significance of the terminology used and the diverse cultural elements at play, as well as the role of English in the increasing internationalization of design education. In their study, “Linguistic and Cultural Perspectives on Globalised Design Education”, Lee et al. (2021) studied the development of both an internationalized curriculum in architecture and design education, and a practice guide for academics, students, and administrators. According to one of the participants, an academic: “the multiple languages drawn upon in design are its key characteristics”. They then

proceed to highlight the importance of multimodality in design teaching and how this helps when negotiating language barriers (p. 175).

When comparing language studies and resources for specific purposes such as accounting, tourism, engineering, law, or medicine, it is important to note that there are only a minority of researchers who are both motivated and enthusiastic about conducting studies on English for design purposes. This presents academic challenges for design students and instructors in general. The lack of research and—its resultant practical applications—has a significant influence on the curricula of Turkish design departments.

English language skills are critical for design education. Students with a specific focus on communication or media may possess more sophisticated requirements in this regard. Designers often need to communicate and collaborate with clients and stakeholders who may speak English as a first or second language. Those professionals who can effectively communicate in English have an advantage when working and building trust with clients, colleagues, and stakeholders from diverse cultural and linguistic backgrounds (Henderson & Louhiala-Salminen, 2011). Effective communication in English allows designers to better understand client requirements, convey design concepts, and solicit feedback to ensure user satisfaction. The ability to articulate ideas and explain design choices in English helps to convey intended messages clearly, persuasively, and professionally.

One of the most important goals of higher educational institutions is to provide students with opportunities to improve their professional communication skills (Gerstein & Friedman, 2016). To this point, it is important to note that in Turkish higher education, English language has hardly ever been seen as a method of communication; rather, it has been considered as a means of reading sources on professional themes (Dearden et al., 2016). This study argues that this is also true for communication design departments.

The traditional teaching approach is no longer sufficient to effectively equip students with the language abilities needed to communicate proficiently in various design contexts. Conventional methods of teaching English for Specific Purposes (ESP) in Turkish design departments require updating. Materials and courses designed to promote professional English language abilities for use in the design field—which is

heavily reliant on multimodal communication and multiliteracies—can also be adapted to this aspect of the domain through the incorporation of design-specific features into a more constructive and multimodal learning approach.

As digitalization has altered the perception, context, and use of traditional media, the study of multimodal communication has likewise expanded to include diverse cultural artifacts such as comics, films, and advertisements, as well as disciplines such as linguistics, semiotics, psychology, and media studies (Duncum, 2004; Van Leeuwen, 2011). A considerable amount of emphasis is placed on multimodal pedagogical practices that empower English language learners to develop their critical awareness and content knowledge (Fedorenko et al., 2021; Grapin, 2019; Kummin et al., 2020; Miller, 2007; Skinner & Hagood, 2008). At a time when higher education is experiencing a significant increase in the amount of research that is being conducted on multimodality, particularly in relation to English for Specific Purposes (Fedorenko et al., 2021; Grapin, 2019; Kummin et al., 2020; Miller, 2007; Skinner & Hagood, 2008), there appears to be a gap in research on exploring how multimodal resources can enhance the professional language skills of design students in non-English academic settings.

A beneficial influence on student engagement and the results of learning can be achieved through the utilization of comics as part of a multimodal learning approach. Boekaerts & Pekrun (2015) and Shuman & Scherer (2014) concluded that multimodality provides an expanded array of engaging activities for participation. In the course of these activities, students are not merely provided with linguistic material; rather, they are actively participating in the process of acquiring relevant information. Specifically in the field of language learning, research has demonstrated that the utilization of comics in tertiary level education leads to an increase in motivation, engagement, and the retention of information (Bai, 2022; Gutierrez, 2022). Over the course of the past few years, comics have gained recognition as an effective medium for a wide variety of academic fields, particularly in colleges and universities. A review of the relevant literature reveals that an increasing number of studies demonstrate the efficacy of using comics as a teaching instrument for undergraduates (Karimi et al., 2022; Silva et al., 2017). Through teacher-made comics, learners not only enhance their language proficiency but also sharpen their

analytical abilities, enabling them to effectively engage with design literature and comprehend intricate concepts.

Despite the substantial development and heightened intricacy of the design field in recent years, there has been a dearth of research and available materials on English for design in Türkiye. Research conducted in English-medium instructional settings offers valuable insights into the use of English for design purposes, yet there is still ample room for further exploration and advancement in this field. To illustrate, we could only identify one anecdotal and one empirical comic study which was conducted in a global university offering English medium of instruction (EMI) (e.g., Kohnke, 2018; 2021). In a qualitative pilot study, Kohnke (2021) used comic strips to simplify complex concepts and created weekly short comics strips to reinforce students' understanding of crucial class subjects in two design-related ESP courses. In the study, students also created comic strips to demonstrate their understanding of specific themes and language. Then, the teacher shared student-made comic strips on the course learning platform. Interviews with ten students were the only way the researcher learned about the students' experiences, which means other important information could have been missed. The findings of the study suggest that using comic strips can change how students learn, making them more active and creative in understanding their subjects. The research also concluded that comics help design students remember target vocabulary and concepts better (Kohnke, 2021).

The findings of Kohnke's study (2021) provide useful information on the methods and potential outcomes of multimodal approaches to English for design purposes. It is of the utmost import that the focus of the field of English for design studies be broadened to include more extensive multimodal approaches, and that the resources that have been developed be shared with the broader academic community. Although there are few citations and a limited number of studies, it is likely that a significant number of instructors actively teach English in design and other design-related disciplines. The various types of research that we conduct enable us to better collaborate, increase productivity, and more effectively share our experiences. This topic is even significant in educational settings where the language of instruction is not English, as it can inspire different experimental, case, and action research projects.

Design is a broad field with a wide range of specifications and a unique language. Understanding design terminology can be difficult even for those who have proficiency in English (Lee et al., 2019). Familiarity with design language can be achieved via several methods, including reading primary and secondary sources or reaching content on multimodal and monomodal media platforms. All of these strategies demand a certain level of proficiency in English language. Design departments require a wide array of more accessible and localized professional language materials in addition to supplementary resources in order to enhance the professional and academic performance of students who are not majoring in English.

In the context of tailoring English for Specific Purposes (ESP) materials for Turkish communication design students, the skills-centered approach gains heightened relevance. This approach prioritizes the development of specific skills and techniques that are directly relevant to the professional and academic requirements of the target field (Hutchinson & Waters, 1987). It not only underscores the development of essential abilities and techniques crucial for navigating language intricacies but also recognizes the pivotal role of English proficiency in accessing design resources and scholarly materials. Given the inherently global nature of communication design, which is deeply intertwined with international trends and innovations, reliance on English-language sources for research, inspiration, and professional growth is substantial (Mechlenbacher, 2009). Ultimately, the skills-centered approach extends beyond linguistic proficiency (Ismagilova & Polyakova, 2014) ; it acts as a bridge between local design practices and the global design dialogue, positioning communication design students as adept communicators and critical thinkers in the field.

Central to this pedagogical framework is the acknowledgment that effective communication design transcends mere visual aesthetics (Worth, 2006). It necessitates a profound grasp of cultural nuances, industry jargon, and design theory, often articulated in English (Gelernter, 1994). Therefore, the skills-centered approach to material design in English for design not only facilitates the refinement of linguistic abilities but also serves as a conduit to access the extensive reservoir of design knowledge primarily communicated in English.

Nevertheless, these materials are expected to accommodate various learning preferences by incorporating constructivist approaches into instructional design

decision-making. The use of a multimodal artifact like the comic can be a viable way to engage and capture the attention of design students. A design element has the potential to influence design students' viewpoints and encourage them to apply their professional critical lenses. In this way, ESP teachers may help them advance in developing their reading skills while simultaneously improving their language competency. To serve these aims, this study offers insight into just how teacher-made physical and interactive comics as design artifacts may urge English reading skills through disciplinary enculturation.

1.3. Statement of the Problem

Research on multimodal/interactive multimodal resources has garnered significant interest from academics and practitioners in recent years, similar. The same is also trued for studies on English for specific purposes and comics. In tertiary education, using comics and interactive comics to foster professional language development via focusing on reading skills, namely in communication design, is a comparatively neglected approach. Indeed, the domain of English for design remains mostly unexplored.

The availability of educational materials and resources in design education has increased significantly due to changes in the nature of education during the global pandemic and the development of new technologies. Nevertheless, a compelling case may be put forth regarding the comparatively limited advancement in the realm of design with regards to the enhancement of professional English. Despite the fact that the design field has expanded and become more complex over the course of the past several years, the teaching of English for design in countries where English is a foreign or second language has remained mostly unchanged. One country that is considered to be lacking in both this area as well as in academic endeavors regarding the study of educational comics at a tertiary level is Türkiye.

1.4. Focus of the Research

The primary objective of this study is to assess the efficacy of teacher-made high-fidelity prototype of a physical comic and its digital interactive version in a specialized English for design course offered by the Department of Communication

Design at Yildiz Technical University in the academic year 2023-2024. Each intervention was comprised of a three-week period of independent self-study activities where the physical comic and its digital interactive counterpart were implemented and tested on a constant basis.

1.5. Research Questions

The research questions and sub-questions that most accurately address key issues and also establish the framework and focus of the thesis are as follows:

RQ1: What are the effects of teacher-made physical comic and interactive comic interventions on the enhancement of communication design students' English reading skills and learning experiences?

> **S-RQ1:** To what extent do the intervention materials impact communication design students' comprehension of design terminology and learning process?
>
> **S-RQ2:** Do interventions differ in motivational factors and how they affect the user experience?
>
> **S-RQ3:** How do teacher-made comic interventions influence students' perceptions and attitudes towards learning through the comics medium?

RQ2: What are the opinions and recommendations of communication design students regarding the prototype of teacher-made physical comic and its interactive counterpart; both as users and informants?

1.6. Significance of the Research

This study holds significance for three reasons. Firstly, there is a lack of comprehensive study of different comic formats and share-alike educational comics in English for design education. To address this, the current study introduces a physical comic and its interactive counterpart, and then evaluates the materials with two groups of junior students. This research represents an initial effort at the undergraduate level to perform a quasi-experimental comparative study of the teacher-made physical and interactive comics. Upon completion of this study, the researcher expects it to yield valuable insights into the feasibility and effectiveness of integrating physical and interactive comics in various educational design settings. By

combining the design thinking process (d' school) with the ten-steps of motivational design (Keller, 2000) as a helpful and workable approach that can be applied in the design of instructional comics created by educators, this study also aims to contribute to the larger field of comics studies. Lastly, this research endeavors to provide benefits to both design instructors who teach in English and language teachers. As the materials themselves enhance primary and secondary design sources' accessibility, they can be expected to provide a helpful model for future research and design education. All three of these share one thing in common: this study provides a detailed analysis and materials that may be used as references for further case and meta-analysis studies.

1.7. Limitations of the Study

The research presented in the thesis has a number of limitations. These are addressed in the following list:

1- The study took place in the Department of Communication and Design in the fall term of the 2023-2024 academic year.

2- The study is limited to 20 junior communication design students.

3- The study only examines a teacher-made physical comic "Norm(s) of Design" and its interactive counterpart *ICDL 1.0.*

4- The research is limited to the "ILT3931 English for Design" course.

5- The research is limited to terminology and concepts related to "Universal Design", "Accessibility and Usability", and "Elements and Principles of Interaction Design".

6- The quasi-experiments are confined to the three-week period during which the intervention materials were delivered.

7- Focus group discussions and follow-up surveys were conducted in Turkish (the primary language of all but one participant).

1.8. Summary of the Chapter

This chapter furnished a synopsis of the study's contextual framework and a succinct examination of the significance of English education in the design field;

encompassing the study's main emphasis, research dilemmas, research questions, and overall importance.

2. THEORETICAL FRAMEWORK

2.1. Introduction

This chapter begins with a concise summary of the links between constructivist epistemology and the multimodal approach in language learning. Next, the importance of multimodal resources in language instruction is examined. The text explores constructivist techniques in comic production and examines the multimodal and interactive elements of contemporary comics, focusing on their role and potential benefits in educational contexts; particularly in higher education and English for Specific Purposes.

2.2. English for Specific Purposes and Constructivist Epistemology

English for Specific Purposes (ESP) is a specialized area of English language teaching that concentrates on providing learners with the linguistic abilities and understanding that are essential to particular professional, academic, or occupational contexts and settings. The history of special-purposes language learning can be traced back to the mid-20th century when the need for specialized language instruction arose in response to the growing specialization and internationalization of various fields (Strevens, 1977). Similarly, Dudley-Evans and St. John (1998) argue that the origins of ESP can be found in the field of English for Science and Technology (EST), which emerged in the 1950s. This specialization was designated to meet the language needs of scientists and engineers who had to communicate their research findings and technical information in English (Johns, 2012). The development of EST paved the way for the broader concept of ESP, which encompasses various disciplines and professional domains. As Swales (1985) points out, the origins of ESP are not completely defined. According to this researcher, the modern period of research into ESP began with Barber's (1962) seminal examination into the existing scientific discourse. In a similar vein, Johns (2013) recognized the

influential contributions of several distinguished scholars in the development of ESP. According to the author, Bazerman's (1988) analysis, which was included in his book titled "Shaping Written Knowledge: The Genre and Activity of the Experimental Article in Science", was one of the significant works that contributed to the growth of ESP. On the contrary, Johns (2012) analyzes ESP in particular periods and divides the history of ESP research in four sections: "The Early Years (1962–1981)"; "The Recent Past (1981–1990)"; "The Modern Era (1990–2011)", and "The Future (2011-)" (p. 5). There is a lack of conceptual clarity with regard to the origin of ESP; yet, the procedures that it employs are more obvious.

The methodology of ESP has been built around the following ground expressions: specific needs; designed for a specific discipline; designed for adult learners and professional language skills (Strevens, 1968; Richterich & Chancerel, 1977; Hutchinson & Waters, 1987; Robinson, 1989; Swales, 1992; West, 1994; Dudley-Evans & St. John 1998; Basturkmen, 2010).

According to Robinson (1989, 1991), ESP is "goal oriented" since students acquire English in order to communicate professionally and carry out activities relevant to their professional context. Dudley-Evans (1998) outlines three essential elements that are typically found in ESP courses: the presence of adult learners, a specific degree of competency, and a fundamental understanding of the target language system. Furthermore, Carver (1983) distinguishes ESP in terms of its application of authentic resources; its emphasis on activities that serve a purpose for the learners; and its arrangement of the learning process in a way that allows for self-access. "Authentic materials" are often associated with the concept of motivation in second language learning studies (Bacon & Finneman, 1990; Breen, 1985; Gebhard, 1996; Kilickaya, 2004; Nunan, 1999; Rogers & Medley, 1988; Richard & Rogers, 2001). Especially in the ESP field, authentic materials are studied in terms of motivation and relevance. Nunan (1999) emphasizes the importance of adult learners being able to recognize the clear connection between what they do or accomplish in class and what they are required to do outside of the classroom. Regarding the process of learning a second language, the constructivist theory posits a higher focus on the role that context and active learning play in the process of knowledge construction (Jonassen & Rohrer-Murphy, 1999).

Constructivism has a profound historical legacy in the domains of philosophy and education, offering a wealth of insights to be derived from its rich heritage (Harris & Alexander, 1998; Matthews, 2003). It is commonly stated that constructivism has resulted in a paradigm shift in the understanding of teaching and learning (Bada & Olasegun, 2015; Copley, 1992). Drawing on the insights of educational theorists like Piaget, Vygotsky, Dewey, and Bruner, student-centered methods have advanced the principles of progressive education (Volansky, 2023).

To be more explicit, constructivism, like behaviorism and cognitivism, is a metaphor for learning (Mayer, 1992). This philosophical and psychological perspective emphasizes the participation of humans in the process of knowledge construction through their engagement with various concepts and experiences (Mayer, 2014). It facilitates learning experiences that prioritize student engagement, utilize many senses, and provide structured support, in contrast to methods that prioritize instructor control and rely on rote memorization (Brooks & Brooks, 1993; Hogan & Pressley, 1997; Mayer & Sims, 1994; Roehler & Cantlon, 1997). Copley (1992) argues that constructivism requires a teacher who actively involves students in their learning and assists in establishing links between their prior knowledge with newly acquired knowledge to faciliate the learning. Therefore, teachers should actively participate in self-reflection and display a readiness to study and incorporate new educational resources (Young, 2003).

Constructivist learning has various applications such as cooperative (Johnson et al., 1998; Kagan, 1989; Slavin, 1990; Sharan & Sharan, 1987), collaborative (Barnes, 1976; Barnes & Todd, 1977), inquiry-based (IL), problem-based (Barrows, 1986; Savery & Duffy, 1995), case-based reasoning (Kolodner, 1993, 1997), research-based learning (RBL) and self-regulated learning (Pintrich, 2000). All these constructive teaching approaches demonstrate the changed role of the teacher (Pelech, 2010). According to Duffy and Cunningham (n.d.), the adoption of constructivism in education has led to a shift in the role of the teacher from being a traditional instructor to that of a “manager or coach” (p. 5). This transition is attributed to the emphasis on activity-centered and student-centered approaches within constructivist teaching. Student-centered learning, the establishment of constructivist learning environments, and the adaptation of existing teaching methods to promote learning outcomes are all examples of constructivist ideas that are

inherent to ESP. As Dudley-Evans (2000) underlines, “ESP developed in parallel with the development of communicative approaches to language teaching and it is arguable that communicative language teaching (CLT) has found a natural home in ESP” (p. 3).

Constructivist epistemology holds that the individual acquires knowledge through the use of their own reasoning and subjective viewpoint (Pouliot, 2007). The learner refrains from adopting a passive-receiving stance and actively seeks out information from particular sources (Gray, 1997). It prioritizes the learner as the focal point, encouraging them to autonomously produce knowledge and cultivate a unique perspective (Applefield et al., 2001). Thus, information comprises active speech, and the learner determines its structure and gets actively involved (Scardamalia & Bereiter, 1991).

Constructivism has evolved into a comprehensive framework comprising various perspectives united by the shared belief that learning happens via activity (Duffy & Cunningham, n.d.). According to the constructivist approach, learning occurs within vaguely defined time limits and through connections to real-world experiences (Rovegno & Dolly, 2006). In contrast to cognitive constructivism, which focuses on individual cognitive processes, social constructivism emphasizes the relevance of social interactions and relationships in the learning process (Kalina & Powell, 2009; Palincsar, 1998). These strands are interrelated with one another and have great importance on the psychological development of the learner. As Cobb (1994) purpots, “the individual’s participation in culturally organized practices and face-to-face interactions as primary explanatory constructs” (p. 15).

Upon considering that ESP prioritizes the growth of professional English communication skills within a particular domain, it becomes apparent that this approach is in line with constructivist theory, which highlights the important role that students play in relation to instruction, as well as their attitudes and motivations (Živković, 2014). The constructivist point of view acknowledges the fact that different modes have a distinct impact on the formation and perception of knowledge (Fosnot, 2013). A multimodal learning approach agrees with constructivist learning theories since it stresses integrating multiple ways of communication and representation throughout the learning process (Gilakjani et al., 2011; Sharma & Giannakos, 2020). This is consistent with the genre-based approach to English for

specific courses (Cheng, 2005, 2006), and as a result, learner autonomy in English for Specific Purposes ESP contexts is being investigated in constructivist blended learning environments (Tarnopolsky, 2012). By making reference to constructivist language learning publications and the constructivist approach in general, Tarnopolsky (2012) highlights the ways in which experiential interactive learning and content-based instruction in ESP meet the principles of the constructivist approach.

Integrating diverse methods of instruction is of the utmost importance in 21st-century educational settings since students are required to be highly skilled in comprehending many forms of written and spoken communication (Moore, 2014; Orlich et al., 2010). According to the constructivist theory of learning, learners generate new information by utilizing their existing knowledge and engaging with their surroundings (Bonk & Cunnigham, 2012; Tam, 2000; Tynjälä, 1999). This idea suggests that learning is a cognitive process that requires active participation (Jonassen & Rohrer-Murphy, 1999). Students might benefit from increased creativity, critical thinking, and engagement when they are exposed to both constructivist approaches and multimodal sources in their educational experiences (Li, 2020).

2.2.1.Review of Related Literature

On the subject of ESP, the literature review shows that research conducted from a socio-constructivist point of view is mostly focused on interactive virtual environments, such as social platforms, vlogs and discussion blogs. For example, Jamali and Krish (2021) utilized their university's learning management system to carry out a case study based on socio-constructivism. ESP students employed an online discussion forum to seek assistance in completing a group task involving the creation of a corporate profile.

Constructivist approaches would be implemented within the framework of ESP writing, and it would require students to actively participate in the learning process by interacting with real-life material and making use of technology in order to analyze and interpret the professional language (Tarnopolsky, 2012). It has been experimentally demonstrated that ESP students could engage more in the learning process when the genre-based approach and computer aided language learning

strategies are combined. With a particular emphasis on accounting students authoring sustainability reports, in a more recent study, Osman and Turiman (2022) developed a learning module that makes use of technology to instruct students on how to write for specific professional purposes. By examining authentic texts from their respective fields, the study aimed to assist students in comprehending and utilizing the language and structures prevalent in professional writing. The rationale of the study was to make writing more entertaining and relevant for students, which could inspire them to participate more. According to the findings of the study, using technology to teach ESP writing with a genre-based approach benefits students, particularly when it involves examining literature from their own field of study. It was found that such an approach could make writing more enjoyable when the content is relevant to their field of study, which may lead to increased engagement in the learning process (Osman & Turiman, 2022). Additionally, former research on genre-based ESP writing has demonstrated that this approach has assisted in the reduction of the ESP students' writing anxiety (Uzun & Topkaya, 2018).

The sheer number of social media platforms and contemporary technological developments have facilitated the ongoing exploration of constructivist methodologies. Nugroho and Rahmawati (2020) reported that *Instagram* could be utilized to improve the writing abilities of ESP students. Additionally, it was discovered that social media platforms effectively increased learner autonomy (Wannas & Hasan, 2023) and the self-confidence of ESP students (Rahman et al., 2019). *TikTok* has been found effective in cultivating ESP students' speaking abilities (Mandasari et al., 2022). This has been of interest for a considerable period, ranging from the early work of Hung on vlogs (2011).

The evidence is equivocal in terms of the impact of constructivist learning and task-based approaches on ESP. Polenova (2017) has probed how constructivist teaching approaches help students benefit from a wider range of strategies when learning English for their professions. In the study, students were given the opportunity to participate in hands-on activities that were directly related to their occupations they would pursue in the future, making the learning process more relevant and integrated. Although the study emphasized professional context and content, it did not specify any particular profession. The instructional strategies involved a collaborative effort between the instructor and the students, wherein the instructor

assumed the role of a coordinator instead of the conventional instructor role. In order to address a wide range of learning preferences and satisfy requirements, the study presented information in various formats and used different modes of instruction, including video, audio, and text. Instruction was carried out in real-world situations with the use of authentic materials in order to assist students in finding connections between newly acquired information and their previous understanding. Throughout the study, authentic learning was emphasized; which implies that instruction is carried out in real-world settings (Pelonova, 2017).

In an ESP class for engineering students, Nimasari (2016) investigated how project work, structured according to a constructivist approach, might assist in the development of students' autonomous learning. The study explored the efficacy of the project work in enhancing students' current knowledge through means of active participation and experiences. The study also analyzed the processes of project work, how it encourages self-directed learning, and the difficulties that are experienced while utilizing the instructional strategy. The findings of the study suggest that engineering students can benefit from self-learning in ESP classrooms via project work and that students are able to expand their knowledge through the use of active learning. The researchers also underlined the pitfalls and shortcomings of such project work. They reported that students may struggle to manage their time and resources, making project work difficult; a lack of clear guidance or supervision might leave students confused about project expectations, and that project groups could struggle if members have different skills, work ethics, or communication styles (Nimasari, 2016).

Most notably, the examination and development of ESP multimedia resources are commonly linked to constructivism in academic literature and studied within its framework (Monje, 2011; Tsai & Davis, 2008; Nieto & Yeste, 2009; Tsai, 2012; Wang & Suwanthep, 2017; Zhang & Lin, 2018).

2.3. Multimodality and English Language and Teaching

The advent of digitalization has altered the perception, context, and utilization of conventional media. Diverse cultural artifacts, including comics, films, and advertisements, have been incorporated into the study of multimodal communication and education, which have intersected with disciplines such as linguistics, semiotics,

psychology, and media studies. It is without a doubt that students are currently living in a world that is saturated by many types of media (Williams, 2007). Thus, the concept of multimodal learning is becoming increasingly acknowledged as an important method for the development of effective educational experiences that are tailored to the varied requirements and preferences of students. Due to the diverse ways individuals engage in today's society, there is a growing demand for incorporating multimodal and interactive content into educational programs (Jewitt, 2012). According to Williams (2014), this rapidly changing scenario presents a challenge for ESP practitioners in the sense that they need to come up with modern strategies, terminologies, and approaches in order to deal constructively with the characteristics of an ESP text in the contemporary multimodal communication environment. Many words combine with the term "multimodal" in different educational contexts; for instance, multimodal approach, multimodal perspective, multimodal pedagogy, multimodal discourse, multimodal texts, multimodal materials, multimodal composing, multimodal ensemble, multimodal teaching, multimodal learning environments, multimodal learning, etc. While digital technologies make it possible to combine the usage of words, images, music, videos, and other types of multimedia, they also extend what are known as "multimodal possibilities" (Lotherington & Jenson, 2011, p. 227). Multimodal possibilities are a growing phenomenon in the field of language education studies. However, multimodality is not only about digital materials (Shipka, 2005).

Kress (2000) criticizes TESOL (Teaching English to speakers of other languages) teachers' misinterpretation of multimodality and the viewpoint that language alone is capable of conveying the complete meaning of a text. Kress (2000) places an emphasis on the significance of possessing a grasp of all modalities of communication that are included in a text and precisely attracts attention to the communication revolution. In his book "Multimodality and Genre", Bateman also puts emphasis on the changing nature of the document and says, "There have been many changes in the use of visual modalities in documents over the past 50 years and the decoding tasks that readers face are becoming ever more complex" (2008, p. 6). As Kress suggests the term multimodality refers to the utilization of various modes, including but not limited to textual, auditory, linguistic, spatial, and visual modes, for the purpose of communication and meaning-making (2003). Modes may be

conceptualized as information representation schemes or the semiotic channels through which we construct texts (Kress & Van Leeuwen, 2001). As Prior (2013) indicates, "the question of how mode and multimodality fits into ESP research depends on what we mean by this term, and its meanings have been neither stable nor fixed" (p. 561). Prior (2013) also underlines that the term "multimodality" appears to be used by some researchers to refer to only digital media and texts.

In spite of the fact that they originate from different historical, technological, and social contexts and have technically distinct meanings, they are frequently understood interchangeably (Lauer, 2009). Lauer says, "Although the terms are often used interchangeably, multimodal has become preferable to multimedia in composition both because it is more theoretically accurate in describing our pedagogies that emphasize the process and design of a text" (2009, p. 231).

Despite the longstanding nature of the issue raised by Kress (2000, 2003), its relevance remains steadfast. Numerous studies have delved into the inquiry of whether English language educators adeptly employ multimodal communication strategies and tools. The collective research findings mutually affirm that English teachers harbor doubts regarding their capacity to incorporate multimodal practices within an educational setting. Fajriah et al. (2021) reported that teachers are not truly aware of how to make the most of visual elements in order to assist students in gaining a deeper understanding of the texts. In one action research product, Yunus et al. (2022) recommended developing strategies and providing a roadmap for future English Foreign Language (EFL) teacher education to incorporate multimodal approaches effectively. Yi and Choi (2015) conducted an experiment during an online TESOL course. They observed that some teachers think using different tools like videos and computers is the only way to teach with multimodality. Additionally, the researchers reported that teachers expressed concerns about having limited time for preparing multimodal lessons; as they were occupied with other responsibilities. Some researchers also point out the lack of sufficient research on the study of multimodal practices in higher education. Sakulprasertsri (2020) highlights a dearth of research on the efficacy of multimodal teaching approaches in enhancing the English language proficiency of Thai university students in practical contexts.

Guo (2004) made a call for ESP instructors and underlined that it is essential for educators and researchers of ESP to recognize and emphasize the variety of

communication channels utilized in academic instruction. The researcher also stressed that ESP teachers ought to modify their research and teaching aims in order to better prepare students for those academic and professional activities that they expect to undertake in both the present and the future.

The application of multimodality in ESP is a study area that is developing at a rapid rate despite the fact that it is still in the very early phases of development (Ladeem & Mallahi, 2019). The present research practices and agenda on ESP more specifically concentrate on "self-regulated learning and multimodal texts" and "learner-generated content and multimodal texts" with a focus on multimodal and multiliteracies pedagocies. In English for Academic Purposes (EAP), multimodal pedagogy and multiliteracies pedagogical research provide frameworks for research practices in terms of writing skill.

2.3.1. Theoretical Frameworks and Perspectives on Multimodality

Language education studies that address multimodality from a socio-semiotic perspective trace the multimodal approach's history back to the works of Halliday (1978); Hodge and Kress (1988); Kress (1996); Bezemer and Kress (2008); Kress and van Leeuwen, (2001); Norris (2004); O'Toole (1994) and The New London Group (1996, 2000). This corpus of work, which was mostly published in the 1990s, focuses on visual communication and the connection between writing and images (Jewitt, 2008). According to Kress (2010), it is framed within a socio-constructivist orientation, with a primary emphasis on the process of meaning-making through the utilization of multiple modalities in social interactions. This scholar also says, "Language isn't a big enough receptacle for all the semiotic stuff we felt sure we could pour into it" (2010, p. 12). The recognition that teaching and learning can take place in a multitude of modalities, including the use of visuals, text, speech, and gestures, is the foundation of a multimodal approach to education (Archer & Newfield, 2014). Thus, it promotes the integration of educational activities using a range of representational modalities. The socio-semiotic perspective underlines the fact that multimodal communication is important in the exchange of information in various settings (Bezemer & Kress, 2015). Stein (2008) defines "multimodal pedagogies" as approaches to curriculum, pedagogy, and evaluation that emphasize

the type of communication used in educational and instructional environments (p. 121).

On the other hand, it would not be wrong to say that most of the multimodal or multimedia education research that focuses on the effectiveness of the cognitive, psychological, and technological aspects of multimodality in language learning base their framework on cognitive and psychological multimodal learning theories. The Dual Coding Theory (Paivio, 1971) proposes that information is processed and stored in two independent but interconnected systems: verbal and non-verbal (visual/spatial). Dual-coding theory-based multimodal language learning studies specifically focus on the processing or retrieval of multimodal information, and investigate the methods by which various modes can be integrated to enhance the efficiency of information retrieval. Multimodal language studies also refer to John Sweller's (1995) Cognitive Load Theory (CLT). CLT is considered to be a foundational theory that was crucial in laying the foundations for multimodal learning (Mayer, 2014). The theory aims "to provide guidelines intended to assist in the presentation of information in a manner that encourages learner activities that optimize intellectual performance" (Sweller et al. 1998, p. 25). The theory places an emphasis on the significance of regulating cognitive load in order to maximize the results of learning and minimize the load to fit into the capacity of working memory (Sweller, 1995; Sweller et al., 2011).

Mayer and Moreno (1998) developed "Multimedia Learning Theory" by expanding upon dual coding theory and CLT (Mayer, 2014). The theory was grounded in the notion of multimedia learning. It seeks to investigate how the presentation of information in various modalities, such as text, visuals, and audio, affects learning outcomes. Mayer (2014) states that "Multimedia learning involves learning from words and pictures and includes learning from textbooks that contain text and illustrations, computer-based lessons that contain animation and narration, and face-to-face slide presentations that contain graphics and spoken words" (p. 171). In "The Cambridge Handbook of Multimedia Learning", Mayer underlines two basic approaches to multimedia learning: technology-driven and learner-centered (2014). The scholar also attempts to list the fundamental and advanced principles for creating multimedia learning environments that are diverse and cover a wide range of disciplines. Many instructional design studies draw inspiration from and apply these

principles to the design process of multimedia learning environments such as the modality principle, redundancy principle, split-attention principle, signaling principle, guided discovery principle, feedback principle, learner control principle, and etc. (Mayer, 2014).

By highlighting the concept that emotions and motives play a mediating role in the learning process, theories that focus on the emotional components of learning stress the premise of affective mediation (Mayer & Moreno, 2000). Moreno's (2006) cognitive-affective theory of learning with media and Csikszentmihalyi's (1997) flow theory are two important approaches that examine the emotional aspects of multimedia learning. New theoretical perspectives resulting from multimodal learning analytic studies can improve the study of how people learn and the analysis of digital traces generated during learning using statistical and computational methods (Giannakos & Cukurova, 2023). The cognitive, social, and affective elements of learning are the subject of this research, which not only postulates on existing ideas but also encourages the formation of new theories, broadens the scope of theories that currently exist, or enables theorists to construct new theories that take into account the inconsistent nature of learning (Schneider, 2022).

Foreign language learning education research, which views eclectic methods as its own methodology, occasionally addresses multimodal learning using a variety of approaches. Empirically, the instructional design of multimodal materials and practices are being developed based on multimodal cognitive or psychological learning theories. Experimental studies are employed to assess the efficacy of multimodal materials for language learning. The proceeding table presents a selection of these studies.

Table 1. Selected Multimodal Language Studies from Literature

Study	Language Focus	Approach/Theory
Li et al. (2022)	Multimodal input and vocabulary learning	Dual-coding & Cognitive Load
Lee (2017)	Effectiveness of visuals in vocabulary learning	Dual-coding
Yang (2014)	Listening comprehension and multimedia	Dual-coding & Cognitive Load
Leissman (2015)	Multimodal texts and reading	Dual-coding & Multimedia Learning
Zavala (1999)	A comparison of monomodal and multimodal reading	Dual-coding
Boers et al. (2017)	Multimodal annotations for vocabulary uptake from reading	Dual-coding

Note: The table was created by the researcher.

Research has shown that students are more likely to be motivated by multimodal materials, which is as an effective tool for English for specific purposes instruction (O'Halloran et al. 2016; Prior, 2012). These materials can capture students' attention and foster their motivation more effectively than typical textbooks, while also enhancing their multimodal competency (Breuer & Archer, 2016; Royce, 2012). Multimodal learning involves gaining knowledge and comprehension through several sensory modalities such as visual, aural, kinesthetic, and tactile channels (Kress & van Leeuwen, 1996). This method acknowledges the variety of learning styles and preferences among individuals and the potential for improved learning outcomes by involving many senses (Lemke, 1998). Within the context of educational scenarios, the term "multimodal learning" refers to the process of imparting information in a variety of formats in order to accommodate a wide range of learning styles and preferences. Archer and Newfield (2014) emphasize that the principle of design is brought to the forefront in the process of developing and creating meaning by employing a multimodal approach.

When we examine multimodal research practices in language learning, we can conclude that the theoretical frameworks of the studies cited are influenced by whether they deal with a multimodal input or multimodal output. We can also deduce that socio-semiotic approach to multimodal learning manifests itself mostly in writing, namely multimodal composition studies.

The current study acknowledges the eclectic nature of multimodal learning and understands it as a holistic approach rather than a theory, utilizing the multimodal aspects of the comics medium from an experimental standpoint. The multimodal

nature of comics allows for multimodal communication via various semiotic sources (linguistic, spatial, gesture, and visual), which is thought to facilitate learning and knowledge construction.

2.3.2. Review of Related Studies: Multimodality and ESP

The purpose of this section is to present a selection of multimodal resources containing practical implications and offering valuable practices for ESP settings. Research on ESP and multimodality is frequent in scenarios where language learners face challenges due to domain-specific discursive, pragmatic, and cultural aspects. Bosnignori (2018) conducted a study to provide an ESP multimodal corpus of movies and television series clips. In the project-based study, the researcher presented an overview of the ways in which these clips might be exploited to teach English in various ESP classes; specifically tourism, law, political science, health & medicine, and business & economics. In truth, Bosignori's study paints a rather accurate picture of the current state of ESP studies. When we look at the areas of focus for ESP research, we often come across these professions.

In their work, Incelli (2023) employed a multimodal corpus approach, combining video clips to investigate the interplay between verbal and nonverbal communication in parliamentary debates to enhance ESP instruction through research-informed analyses. The study focuses on university students in advanced English language classes at the Faculty of Economics. The research makes use of *ELAN*, a multimodal annotation software, in order to identify and further investigate the interplay between verbal and non-verbal aspects in the context of parliamentary debates. In order to study the ideological content and communicative goals of legislative speech, Incelli (2023) employed a combination of critical discourse analysis (CDA) and critical multimodal discourse analysis (CMDA). For the purpose of enhancing business undergraduate students' awareness of the multimodal aspect of communication, classroom exercises that are oriented around the analysis of multimodal texts were utilized. These activities specifically focused on the ways in which linguistic qualities and nonverbal aspects such as gestures and visuals contribute to the process of meaning-making in ESP programs. The study demonstrated that the incorporation of multimodal literacy into an ESP university curriculum has the potential to significantly enhance students' comprehension of verbal and non-verbal

communication, particularly in the context of parliamentary debates. As a result, the researcher reported that the utilization of a multimodal corpus of video clips for the purpose of instruction was helpful in enabling students to acquire a more comprehensive understanding of the intricate relationship that exists between spoken language and non-verbal cues such as gestures, which are essential for efficient communication in certain professional situations.

Incelli's study also underlined the pedagogical benefits of multimodal teaching approaches, indicating that these methods can motivate students and promote learning by making the meaning and understanding of complex aspects of discourse more accessible. However, the study also brought to light some potential challenges and limitations, such as the fact that the construction of multimodal corpora is a labor-intensive process and that additional teaching time is necessary in order to successfully incorporate multimodal activities into a curriculum (Incelli, 2023).

Kohnke et al. (2021) investigated the impact of digital technology on how students create and consume text, emphasizing the significance of different communication methods in the learning process. The study emphasizes the significance of digital multimodal composition (DMMC) in second-language (L2) writing. DMMC uses a variety of modes to improve language proficiency, including images, graphs, and text. The paper also delves into the concept of authentic assessment, which involves using infographics to create real-world scenarios in which students can apply their knowledge in practical, professional settings. Kohnke et al. (2021) used a qualitative interpretive methodology to gain a thorough understanding of students' attitudes toward the use of infographics for assessment in "Professional English for Design Communication" at an English-medium university in Hong Kong. A purposeful sample of twelve students was chosen to gain comprehensive insights into their experiences with infographics in their course. In addition to having an English proficiency level that was equivalent to a score of 6.5 on the International English Language Testing System (IELTS), every participant had previously finished a general English for Academic Purposes (EAP) course during their first year of study. Every student participated in an individual interview that lasted 42 to 58 minutes. The interviews were conducted in English with the goal of gathering students' thoughts and experiences. Kohnke et al. (2021) recommended that future research should employ a variety of methods, such as discourse analysis and questionnaires,

to gain a more comprehensive understanding of the potential of infographics in the teaching of ESP and the potential for these methods to be applied to different communities. Furthermore, the researchers suggested that infographic assessments should highlight specific projects students are currently working on as part of their major studies. The researcher emphasizes that this will enhance the connection between their English acquisition and their field of study.

2.4. Multimodality, Interactive Multimodality and Today's Comics

Comics is a unique artistic medium that combines visual elements and written words to communicate a narrative (Petersen, 2010; Saraceni, 2003). Nevertheless, there is a discrepancy in viewpoints regarding the fundamental elements that constitute comics. Some suggest that it is the succession of graphic representations, whereas others say that the combination of words and images is the key factor. Eisner (1985) defines comics succinctly as a type of "sequential art" in which pictures or images are juxtaposed alongside words to effectively convey a narrative or message. Comics, according to Scott McCloud's (1993) definition, are "juxtaposed pictorial and other images in deliberate sequence" that are created with the intention of communicating information and/or eliciting "an aesthetic response" from viewers. (p. 9).

On the other hand, Harvey (2001) and Meskin (2007) contend that these definitions are overly broad and obsolete. Meskin (2007) also adds that there is no need for a description to identify, evaluate, and understand comics. Similarly, a number of comic scholars rejected the feasibility of a conventional definition of comics by appealing to Wittgenstein's concept of a family resemblance (Freedman 2011, p. 32-33; Varnum & Gibbons 2001). Gibbons and Varnum (2001) argue that "comic strips, comics, graphic novels, single-panel cartoons, wordless comics, animated cartoons and various other kinds of visual texts bear family resemblances to one another" (p. xvi).

The debate observed here stems from the fact that comics can exhibit significant variations in terms of style, content, and format; which presents a challenge in formulating a definition that encompasses all potentialities. The French theorist Groensteen (2007) emphasizes that one of the most distinctive features of comics as a medium is "iconic solidarity". To clarify this, he defines comics "as interdependent

images that, participating in a series, present the double characteristic of being separated...” (2007, p. 18).

Based on the definitions provided by Groensteen (2007) and McCloud (1993), one can argue that a cartoon consisting of only one panel does not match the necessary criteria to be classified as a comic. Nevertheless, there are numerous comics scholars who contend that the opposite is accurate. Comics encompass a diverse array of genres and styles, spanning from narratives about superheroes to informative thematic publications. This great variety of content makes it challenging to establish a precise definition for the medium. The diversity of purpose in comic production, distribution and reading---including pleasure, education, and social commentary---contributes to the absence of agreement on a singular definition. There is no definition that can possibly be both exact and comprehensive enough to include all of those forms. This study acknowledges the differentiation between comics and graphic novels, as well as comics and comic strips, depending on their length and level of narrative complexity. Additionally, the terms “comic book” and “comics” are used interchangeably throughout the study. Nevertheless, the literature review in this study is based on the idea that comic strips, comics, and graphic novels are multimodal; indicating that they incorporate both visual and linguistic elements and are used for educational purposes. To serve this aim, the study does not differentiate between these forms in its review of related studies. The use of different names to describe educational comics, together with attempts to categorize them or build a genre by inspiring the artistic elements of well-known comics or graphic novels, could exacerbate and closely link to the previous discussions. The definitions, “data comics”, “information comics”, “information comic”, “instruction comic”, and many others, are compelling enough to warrant separate examination and inquiry. Similarly, Kuttner et al. (2017), in “How to Draw Comics in a Scholarly Way”, clearly state that they are not attempting to define what constitutes a comic and what does not, but rather what comics are capable of accomplishing.

Comics provide an exceptional opportunity to investigate multimodality due to the intricate interplay between written language and a “visual language” of images, where either one can impact the content or structure of the narrative (Cohn 2016a; McCloud, 1993). According to McCloud (1993), there are three distinct kinds of surface semantic relations: “word-specific”, “picture-specific”, and “duo-specific” (p.

153-154). McCloud's theory established a continuum that proves the "semantic dominance" of one modality over another, thereby establishing which modality is the most profoundly significant in the meaning making process. Neil Cohn's (2013a, 2013b, 2014, 2016a, 2016b) substantial contributions have advanced the comprehension of how comics communicate meaning via a fusion of linguistic and visual components; the phenomenon commonly termed "multimodality". Through analysis of the interactions between linguistic and visual elements, including speech balloons, layout, images, and gestures, Cohn investigates how readers interpret and comprehend comics. Using concepts from semiotics, psychology, and linguistics, he has constructed conceptual frameworks to elucidate the cognitive processes involved in comic book creation and reading (2016a, 2016b). Similarly, Jacobs (2016) defines how visual and written components work together in comics:

> This combination of words and images—multimodality— works to create meaning in very particular and distinctive ways; in a multimodal text, meaning is created through words, visuals, and the combination of the two in order to achieve effects and meanings that would not be possible in either a strictly alphabetic or strictly visual text. (p. 5)

Comics, as a multimodal medium, pique the curiosity of scholars from a wide range of fields and offer intriguing research points. Research practices in comics encompass a diverse range of approaches employed to investigate and evaluate different facets of the medium. Due to the breadth of topics covered, comics studies are inherently interdisciplinary, drawing from fields as diverse as philosophy, literature, art, media studies, semiotics, education, and cultural studies (Eisner, 1985, 1996; Groensteen, 2007; Cohn, 2013; Harvey, 1979, 1994; Heer & Worchester, 2009; McCloud, 1993; Meskin, 2001; Kukkonen, 2013; Wigand, 1986; Cohn, 2013). Each of these lines of inquiry contributes to a deeper understanding of comics as a medium, their cultural significance, and the wide variety of creative and interpretative possibilities they present. The history of comics as an educational and cultural medium has seen various stages of development, from popular science and educational comics to interdisciplinary approaches and the formation of 'Comics Studies' as a research field. The earliest examples of educational comics studies written in English language were conducted in the domains of literacy (Dyson, 1997; Koenke, 1981; Morrison et al., 2002; Schoof, 1978) and history education (Chilcoat,

1993; Chilcoat & Ligon, 1994; Dobrowolski, 1976). Richie (1979) has shown that comics have an unlimited potential in educational settings.

Initial empirical research revealed that the appeal of comic books as literary resources for children, teenagers, and adults stems from two major factors. Comics gained greater appeal and significance for readers as a result of their initial appreciation for the medium's humorous content (Brown, 1997). In addition, comics incorporated resolutions and witty remarks that stimulated the reader's anticipation for the next panel, fostering a greater level of engagement with the content (Brown, 1997). At first, researchers endeavored to measure the attractive attributes of comics by initially seeing and thereafter recording students' reading duration. In their study, Arlin and Roth (1978) found that when students considered comics more captivating, they were more inclined to invest additional time in reading and actively seeking answers to problems presented in the text.

The available research points to a broader perspective. Mallia (2007) stresses that comics studies view comics just as a stimulus. For Mallia, comics are more than "a stimulus for awareness"; comics can function as a pedagogical tool that directly generates a mental effect (p. 107). To test their hypothesis, the researcher (2007) conducted experiments with three different versions of the same story to see if comics could be as effective a cognitive tool as traditional or illustrated text. Following implementation of each material, the researcher asked the students a series of questions to gauge the impact of that material on their recall, retention, and comprehension. The study revealed that there was no significant difference in test results, and the comic version was just as effective at conveying historical information as the two more traditional forms. More recent and similar evidence is also available. Dunst et al.'s (2018) book "Empirical Comics Research" compiles recent empirical research by some of the field's prominent researchers. The book brings together fifteen publications covering three distinct approaches: digital approaches to comics research, linguistics and multimodal analysis, and cognitive processing and comprehension. The multimodality of comics is the focal point of each research approach, and the comics scholars involved attempt to investigate modalities in conjunction with one another, individually, or cognitively.

The field of cognitive studies in comics offers valuable insights into the cognitive processes involved in reading and understanding sequential visual narratives. These

studies provide a better understanding of readers' engagement with comics, the conveyance of meaning through the distinct combination of pictures and text, and the effective utilization of the medium for diverse communicative and expressive objectives (Cohn, 2020).

Comics require readers to actively interpret the information and visualize what happens between the panels due to their combination of textual and visual elements (McCloud, 1993). In a similar fashion, constructivism focuses on learning through practical experiences and developing cognitive maps. This teaching approach helps readers grasp concepts more effectively and apply them in practical scenarios (Wilson, 1996). Reading comics aligns with the constructivist approach, which emphasizes learning through personal experiences and knowledge construction. This is due to the fact that reading comics requires the reader to engage in a sort of mental activity (Cohn, 2013; Cohn, 2020). Readers can analyze the medium characteristics of the graphic art and design of the comics by visually examining its multimodal content (Cohn, 2013).

As an effort to understand this aspect, eye tracking research is carried out to learn more about how readers visually engage with sequential art and where their attention is focused on the page. These studies allow for a detailed analysis of eye movement patterns, such as fixations and saccades, which can reveal what readers focus on and ignore within the comic panels (Toyoura et al., 2012). Eye tracking experiments have been conducted to explore learning with comics, specifically in the context of geography education, and have shown that comics can promote deep learning when combined with maps (von Reumont & Burke, 2020). Additionally, eye tracking technology allows for a detailed analysis of visual attention, providing information on what individuals focus on and ignore within a comic's layout (Smolucha, 2020). These studies have also investigated the contributions of external structure (panel outlines) and panel content in the reading process, revealing that both factors play a role in determining reading order (Kirtley et al., 2022). Eye-tracking studies also compare print-based comics reading with screen-based comics reading (Kumar & Dhar, 2023).

Perhaps most importantly, technological advancement has revolutionized both the production and distribution of the comics medium (Cohn, 2007; McCloud, 2000; Werschler, 2011). In addition, this significantly affects the focus in theoretical and

scientific approaches to comics. The internet and web technologies have given rise to webcomics and online platforms as channels for authors to immediately disseminate their work to a global audience (Cohn, 2010; McCloud, 2000; Hernandez & Bautista, 2023). Webcomics are digital comic strips that initially made their debut and were published in a serialized manner (Jacobs, 2014). In digital space, creators have the ability to bypass conventional publication channels (Cohn, 2010) and to connect with a wider audience, thereby democratizing the medium and enabling a variety of alternative storytelling techniques. In "The Visual Language Manifesto: Restructuring the 'Comics' Industry and its Ideology", Neil Cohn (2007) says:

> Additionally, very few creators have the financial means with which to publish and distribute their work successfully, and are thereby forced to sell their labor to the major companies. On the economic front, the Internet provides the most democratic structure in contrast to the aristocracy of the print industry because, by and large, everyone on the Internet has a fair shot at success. Granted, audiences still need to find authors' sites in the vast digital sea of material, but there are no measures preventing this such as they exist in print, like 1) the necessity of a publisher and distributor (even if its one's self), 2) printing costs, 3) a limited distribution system, 4) a limited network of available outlets (i.e. comic and book stores), 5) marketing costs, etc. (p. 10)

When reflecting on the aforementioned quote and the current state of online platforms, it becomes evident that the widespread availability of digital comics and e-readers has significantly enhanced readers' capacity to consume and acquire comics through digital media; consequently leading to a surge in academic interest in the field of comics studies. Users may easily access and download comics onto their smartphones for convenient and immediate reading using services like *ComiXology*, *Marvel Unlimited*, *DC Universe*, *Webtoon* and *Tapas*. These platforms frequently include features like reading assistance, zoom capabilities, digital bookmarks, and offline reading, thereby enhancing the digital reading experience. Comics have become more easily obtainable due to digital distribution, which has also led to a decrease in production expenses and the elimination of regional limitations (Cohn, 2007). At this juncture, further technical, industrial, and cultural discussions related to webcomics such as sprite comics and webtoons have been bypassed based on the fact that these alone would demand a whole chapter.

Thanks to advancements in technology, the extensive history of comics has also been successfully preserved and digitized. Various organizations such as libraries,

museums, and comic book publishers are currently converting rare and out-of-print comics into digital formats to establish digital archives for research, preservation, and accessibility (Aggleton, 2018; Graham, 2016). This helps in exploring the rich history of comics and preserving the original works, but also delimits the reading experience (Goodbrey, 2013).

Needless to say, the advent of digital technology has completely transformed the process of comic creation (McCloud, 2000). Conventional manual illustrations have been enhanced by the integration of digital instruments, such as graphics tablets and design software (Brodén, 2024; Miller, 2008). Artists now have the ability to produce elaborate and refined artwork by utilizing digital brushes, layers, and color palettes (Miller, 2008). This has enhanced productivity and expanded the range of artistic opportunities. Nowadays, everyone can be a comic artist thanks to online platforms and software technology (Nairat, 2021). Creating webcomics has never been easier thanks to the wide range of tools available online. From simple drag-and-drop interfaces to advanced drawing software, aspiring comic artists have endless possibilities to bring their stories to life. With social media platforms allowing for easy sharing and feedback from readers, the comic community has never been more vibrant and accessible. Online platforms offer a valuable resource for novice creators, educators with a passion for comics, and parents seeking to delve into the world of creating comics and cartoons without the prerequisite of proficient drawing or software abilities. Undoubtedly, these platforms serve as a convenient and innovative medium for visually conveying ideas and narratives.

Nevertheless, digitalization of comics has engendered discussion on hybridization of the medium (Gilmore, 2014; Neo & Mitchell, 2016; Soares et al., 2013). With the capacity to blend analogue and digital components, digital comics can take hybrid methods, resulting in unique visual styles and narrative experiences (Dittmar, 2012; Gilmore, 2014). In their study “Mediality and Materiality of Contemporary Comics”, Thon & Wilde (2016) discuss the materiality and mediality of contemporary comics and the transformation of the reading and viewing experience.

Some discussions specifically center on the ways in which comics, animation, and gaming are distinct from one another. Gilmore (2013) underlines that although digital comics include animated and interactive elements, it is critical to maintain the reader’s control over the story’s flow and direction. Readers must be allowed to

actively participate in reading rather than being forced to take a passive role, like they do while watching an animation.

Gilmore (2013) also mention the negative impacts of converting traditional print comics for viewing on the smaller screens of smartphones and tablets. He argues that this may result in a reduced reading experience; restricting the reader's ability to fully appreciate the structure and style of a comic book. The scholar also pinpoints the fact that the transition of comics to digital formats has the potential to compromise the unique traits that distinguish them, especially when additional media aspects such as animation and games are included. Thus, achieving a perfect balance is critical to ensuring that digital comics preserve their essence (Gilmore, 2013). At least, we can say that it was true for western experimental digital comics production.

There has been a convergence of gaming engines and comics in the form of game comics, which are games based on comics qualities (Tobita, 2010). This combination uses digital adaptation to explore the aesthetic appeal of comics by combining video game and fun elements with the storyline (Tobita, 2010). However, hybridity in convergence is also controversial. Some believe that the inconsistency between digital games and comics demands a medium-specific analysis rather than a comprehensive one (Goodbrey, 2014). Goodbrey asserts that it is also possible to gain a better understanding of how digital media may convert conventional forms, such as comics, into interactive experiences that appeal to both gamers and comic readers through the analysis of game comics (2014). Interestingly, Backe (2019) contends that digital games and comic books, when combined, do not form a cohesive hybrid category as they are too diverse from one another. The researcher here argues that each and every instance in which comics and video games interact is required to be investigated on its own, without making the presumption that it falls into a hybrid category. Predominantly, Backe (2019) asserts that the concept of hybridity is not the most effective way for appreciating and studying the connection between comics and video games; but is rather more suited to the humanities.

Likewise, there has been a merging of visual novel engines and comics resulting in the creation of interactive comics. Comic artists utilize technologies intended for visual novels to produce these interactive works. It is feasible to repurpose the tools utilized in crafting visual novels for the development of interactive comics, even though visual novels and comics exhibit distinct forms and styles.

Comics continue to explore completely novel realms with the help of augmented reality and virtual reality technologies (Backe, 2019; Cohn, 2013; Goodbrey, 2013, 2014; Groensteen, 2013). Smartphone apps or other devices employ augmented reality technology to overlay supplementary digital content, such as animations, sound effects, or interactive elements, across comic pages. In practice-based and research-based studies, potential hybrid variations of comics are analyzed in educational settings (Koutromanos & Sofos 2018; Nidhom et al., 2019; Sakamoto et al., 2020; Smaragdina et al., 2019). Both virtual reality (VR) and augmented reality (AR) comics represent innovative ways to experience graphic storytelling, each with its unique advantages and challenges.

The application of artificial intelligence in comics production is a hot topic. However, the use of machine learning and deep learning techniques to analyze and study comics and cartoons is not new (Fujiono et al., 2019; Nadikattu, 2014; Ngyuen et al., 2018; Uçan, 2017). Ueono et al., 2016). Ueno et al. (2020) investigated the algorithmic process for creating comics and animations. Researchers are currently interested in using artificial intelligence to create comic books (e.g., Gunasekara et al., 2024; MacGeorge, 2024).

While recent research on digital comics tries to define and differentiate the graphic narratives (Sayilgan, 2022, 2023), this seems to be harder and require more than a mere typology. Wilde (2015) states that the definition and interpretation of media, such as comics, are not fixed but rather prone to change as a result of the developments in technology and alterations in cultural norms. Inevitably, our current understanding of what constitutes comics may shift in the years to come, which could encourage us to adopt a broader perspective about new forms of media (Wilde, 2015). Following the same line of reasoning, it appears that this is also true for digital interactive comics.

In 2024, Gagnes et al. edited a volume called “Multimodal Comics: The Evaluation of Comics Studies”. This book brings together a wide range of academic works that examine comics from both formalist and sociocultural perspectives, focusing on the various ways in which comics use multiple modes of communication. The book offers a thorough assessment of the field’s development over the past twelve years. In the preface of the book, Roger Sabin emphasizes the potential for comics to explore new modes in the future and challenges readers to consider the limitless

possibilities of comics as a medium for creative expression and cultural commentary (2024).

Future developments in technology will certainly impact the approaches taken to both research into and the creation of comics. As can be understood from this section, technological advancements have emerged as significant catalysts for the comic book industry and research agenda, facilitating the introduction of digital creative tools, online platforms, and immersive experiences; in addition to augmenting readership and creator opportunities. Within the framework of this present thesis, it is essential to prioritize the remarks of Dittmar (2015). This comics scholar emphasized the benefits of digital comics in making stories more interesting, which could encourage educators and multimedia designers to collaborate to create educational content (Dittmar, 2015). Thus, further research is strongly recommended to delve into the utilization of digital and interactive comics in education and to enhance the development of curriculum materials and instructional methodologies.

2.5. Use of Comics in ESL/EFL

A longer period of time has passed since the introduction of Spider-man, and the history of education and research on comics as an instructional material extends back even further such as Sones (1944) and Hutchinson (1949). Having projected the significance of comics in the field of education as well as their instructional role in the future, Arbuthnot (1947) comments as follows: “Someday someone will allow children to develop their own comic strip characters and plots. For older children it would be an admirable way of developing a more critical attitude towards this material, as well as of introducing them to a clever technique full of creative possibilities” (p. 182). Although Arbuthnot’s ability to express their thoughts precisely was hindered by the conditions of that particular period, the point they were trying to convey remains an ongoing focus of the academic community. In 1993, “student-generated comics” appeared in the title of Clicoat et al.’s study pertaining to history education, and in 2002, Morrison et al. used the same expression in their study and investigated the effects of student-generated comics in literacy education.

The use of comics in education is supported by multiple theoretical frameworks, including cognitive load theory (Sweller et al., 1988), dual-coding theory (Paivio, 1971), and constructivist learning theory (Vygotsky, 1978). These theories suggest

that the multimodal nature of comics can aid memory retention, motivation, and deeper cognitive engagement (Aleixo & Summer, 2016; Cary, 2004; Nalu & Bliss, 2011; Sousanis, 2015).

When considering language instruction and development, comics can serve as an indispensable resource in English as a Foreign Language (EFL) and English as a Second Language settings (ESL) (Graham, 2011; Norton, 2003; Norton & Vanderheyden, 2003). They have the potential to improve students' proficiency in language, maintain their attention and improve their motivation throughout the learning process. James W. Brown's research in 1977 is the earliest known English study on utilizing comics for foreign language learning. In his study, Brown (1977) tried to provide a theoretical basis for comprehending the experiences of language learners when reading comics in a foreign language. Brown (1977) focused on three distinct aims. He attempted to establish a theoretical framework for analyzing comics in foreign language classrooms, evaluated key areas of comic pedagogy in France, and offered a brief bibliography of recent publications on the topic. This implies that educators in France had influence on overseas educators in the integration of comics into the class. Similarly, Barberis and Grüning (2021) argue, "Comic artists in France were closer to the intellectual field than were comic authors overseas; therefore, their cultural legitimacy was higher in Europe" (p. 132). When it comes to the legitimacy of the medium in educational settings, the same also appears to be true.

In EFL and ESL studies, comics are frequently analyzed within the framework of authentic materials and motivation (e.g., Hoffman, 2018). This analysis typically takes the form of experimental reading interventions, as demonstrated by studies conducted by Liu (2004), Jones (2010), and Roozafzai (2012) as well as through the exploration of learner-generated content (e.g., Megawati & Anugerahwati, 2012). Furthermore, comics have been found to be particularly beneficial for low-achieving students, as evidenced by research conducted by Yunus et al. (2012). Additionally, comics are often utilized in the context of multiliteracies pedagogy and multimodal approaches (e.g., Elsner, 2013; Rajendram, 2020; Lewis & Lewis, 2021; Lotherington & Johnson, 2011).

According to Carter (2007), English teachers can improve their lesson plans by incorporating graphic novels and comic books, thereby moving beyond traditional literacy to include visual literacy. The scholar here maintains that the use of comics

in the classroom creates a more inclusive and welcoming learning environment and promotes higher student participation. In their study, Danzak (2011) reported a project called “Graphic Journeys”, in which a group of English language learners created comic-style tales about their experiences emigrating to America. The study employed multiliteracies pedagogy, which also included a variety of media. The study explains how integrating visual imagery with writing practices can help students both communicate and learn more effectively. The study also concluded that facilitating opportunities for self-expression can enhance student engagement (Danzak, 2011).

Early comics studies also included project-based language education studies. Ramani and Joseph (2002) conducted a study to examine the engagement and learning outcomes of adult learners with minimal literacy abilities when reading comics. The participants was included in a broader initiative focused on instructing English beginners through a method of instruction that integrated reading with interactive assignments. The learners demonstrated enhanced linguistic creativity by actively recounting the stories they read from the comics; so facilitating improved self-expression. It was observed that the language learners cultivated a profound desire to own books, experiencing a deep sense of attachment to the narratives after actively participating in tasks and activities related to them.

Additionally, specific theories were also used as the basis for the arguments in early research that investigated the use of comics in language learning. Liu (2004) investigated the advantages of using comics as visual tools in language learning to enhance reading comprehension. The study placed a particular emphasis on the significance of dual coding theory in the context of integrating language and images in order to increase the effectiveness of learning outcomes. In a more recent study, Lapidus (2023) discussed the formulaic nature and multimodality of comics and tried to present the positive effects of using comics in ESL/EFL learning.

This section established the foundation for the rest of the chapter by presenting a succinct overview of the use of comics in EFL/ESL learning. It included preliminary studies on the utilization of comics for language learning. However, there has been limited focus on recent studies that specifically examine the use of comics for young language learners. The study acknowledges the abundance of research on this topic, which could potentially require the compile of an entire thesis.

2.6. The Rise of Teacher-Made Comics

A significant amount of literature reviews are being undertaken simultaneously with the increasing number of empirical studies on comics. These secondary studies focus on the benefits and drawbacks of incorporating comics into academic environments (Azman et al., 2014; Clark, 2017; Laffier & Luchka, 2021; Sagri et al., 2018; Topkaya et al., 2023; Wallner & Barajas, 2020).

Although comics are effective, researchers analyzing ready-made comics emphasize the importance for educators to be cognizant of the potential challenges they present, including issues related to content suitability (Chaikovska, 2018; Rakhmawati, 2018), language proficiency (Mahir et al., 2016) and balance issues between linguistic activities aimed at improving both writing and speaking skills (Kohnke, 2018; Rokhayani & Utari, 2014). In their comprehensive review, Wijaya et al. (2021) pinpointed challenges hindering the integration of comic strips in language education, such as concerns regarding relevance, selection of suitable themes, and inadequate focus on fostering communication abilities.

The best way to deal with these challenges is to create your own instructional comics. Nevertheless, the process of crafting comics demands a substantial dedication of time, encompassing the intricacies of plot and character development, as well as the meticulous planning of layouts and panels (Schäfer, 2017). It can be quite time-consuming, especially for creators managing long hours of teaching and the need to design other materials (Crăciun & Bunoiu, 2019; Poryadchenko & Lytvynova, 2023). Producing comics can be also a costly undertaking, particularly when teacher-creators must allocate funds for art supplies, software, or printing expenses. Additionally, researchers have brought attention to a number of challenging factors pertaining to create comics, including the amount of time spent drawing (Kurt, 2021) and the management of time (Muyassaroh et al., 2020).

There exists a plethora of software and online platforms available to educators and artists. For example, *Pixton* stands out as a renowned online platform that empowers users to craft their own comics, cartoons, and storyboards through an intuitive drag-and-drop interface. This platform is known for its user-friendly nature and vast library of pre-designed characters, props, backgrounds, and speech bubbles for users

to select from. Moreover, *Pixton* users have the ability to customize their creations by adjusting the postures, facial expressions of the characters, and text formatting.

In addition to *Pixton*, there are several web-based platforms that offer comparable functionalities for creating comics and cartoons online. One such platform is *MakeBeliefsComix*; a complimentary online tool that provides a diverse selection of characters, backgrounds, and resources for crafting comics and cartoons.The platform also provides support for educators, with a section dedicated specifically to English and literacy education (Makebeliefcomix for ESOL/Literacy Students - Create Your Own Comic Strips Online With MakeBeliefsComix, 2023). Bill Zimmerman, the platform's creator, wrote several articles highlighting the effectiveness of digital comics on the English language skills of reluctant learners (2010) and informing teachers about the positive outcomes of the student-created comics (2008).

Another important design tool is *Canva*. It is not designed for comics creation like some other dedicated comics platforms, but its adaptability and easy-to-use interface make it a viable option for teachers and researchers who want to create comic strips. There were also a number of other platforms that were operational in the past but have since been closed or relocated for various reasons. To illustrate, *Bitstrips* and *Toondoo* were two platforms that enabled users to create comic strips and cartoons with a variety of customizable characters and backgrounds.

By utilizing a JavaScript library, *Comicgen* makes it possible to create comics, precisely characters. *Comicgen* offers users to select a character's angle, emotion, and pose. It also has a web-based online tool to make the process easy for those who do not have programming knowledge. Moreover, there are some special platforms that host webcomics. Users are able to publish their own web comics on a well-known platform known as *Comic Fury*, which offers a wide variety of customizable themes and features.

Secondary research also delves into the utilization of technology in the creation of educational comics. A study carried out by Winarti et al. (2018) exemplified how contemporary technology can assist teachers and students in crafting digital comics. Similarly, the researcher aimed to investigate the influence of technology on the development of educational comics studies. While not exhaustive or methodical, a

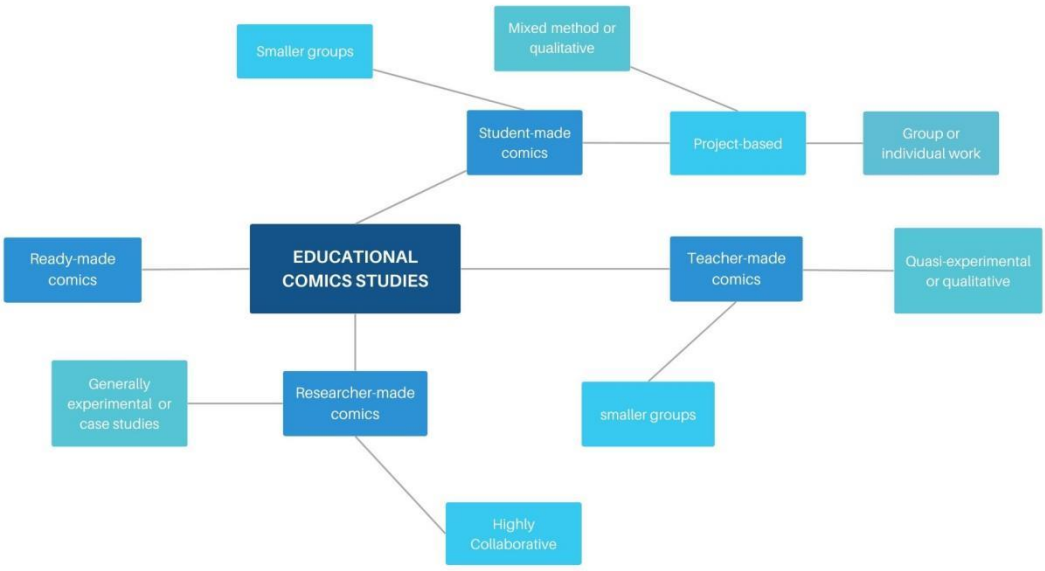
concise examination of the literature emphasizes the significance of these tools in the research practices related to educational comics (see *Table* 2).

Based on the information presented earlier, it is evident that the tools utilized for creating comics have progressed alongside technological advancements, leading to a rise in the incorporation of comics in academic curricula. The accessibility of photo-mechanical processes and the abundance of online comic generators and software have significantly reduced the obstacles encountered by teacher-artists.

Based on the literature examined in this thesis, it is evident that there is a greater abundance of student-made comic studies compared to those conducted by researchers and educators. Nevertheless, such a conclusion is solely possible via a systematic review. This could be attributed to the simplicity of production made possible by the abundance of comics creation platforms.

Considering these developments and the research, we can divide educational comics studies into four groups: ready-made, student-made, researcher-made, and teacher-made comics studies.

Figure 1. An Experimental Outline of Educational Comics Studies



Note: The figure was developed by the researcher.

The diagram depicted in Figure 1 aims to illustrate this plausible inference by encapsulating the overarching traits of this categorization. Undoubtedly, it serves as a preliminary schematic that warrants additional investigation.

Many researcher- or teacher-made educational comics studies apply ADDIE model (Analyze, Design, Develop, Implement, and Evaluate) (e.g., Febriani et al., 2021; Lesmono, 2018; Listianingsih et al., 2021; Mamolo, 2022, Giri Kartika et al., 2023; Nugroho et al., 2024; Radeswandri et al., 2021; Pulungan, 2023; Suri et al., 2021), ADDE model (Analyze, Design, Develop, and Evaluate) (e.g., Ferdiawan et al., 2021; Nopita et al., 2022), Reeves-model DBR model (e.g., Kusrini et al., 2020) and other relevant research based design methodologies for creating their comics including Research and Design- 4D model by S. Thiagarajan for media development (Define, Design, Develop, Disseminate) (e.g., Maria et al., 2022; Saputra & Pascha, 2021). Although these models provide methodical development procedures, they also divert academic attention away from design decisions and creative expression. When we examine the models used in the aforementioned studies, it can be concluded that the research conducted with the Research and Design-4D and the Reeves-model DBR model reflects the design process more precisely.

The majority of the time, these studies employ a quasi-experimental study design in order to evaluate the efficacy and feasibility of educational comics, in addition to validating their design. Inevitably, this type of research is carried out over an extended period of time by a minimum of two or three researchers, and sometimes even more. It is practically impossible to determine the extent of input in design choices; the researchers' role in the design process is not always specified (e.g., Febriani et al., 2021; Lesmono et al., 2018). This is feasible due to the fact that they heavily rely on the representation of informants and the evaluation of experts based on their design methodology in addition to experimental findings. Additionally, this seems to restrict their ability to represent their experiences with comics design to audiences (e.g., Radeswandri et al., 2021). Some of these publications provide readers with a large amount of tabular data providing statistics rather than visual extracts from their comics (e.g., Nugroho et al., 2024) or descriptions of design tools (e.g., Diah et al., 2019; Radeswnadri et al., 2021). Thus, further investigation is necessary to assess and compare the design methodologies employed in educational comics.

The present thesis provides a succinct examination of educational comics created by teachers and researchers, aiming to refine the categorization of such materials and explore the influence of tools used in educational comics studies.

Table 2. A Brief Review of Teacher-Made and Researcher-Made Comics

Teacher-made	Year	Target Audience	Design Tools	Domain
Uy. E.	2018	High School	No mention	Mathematics
Samosa, R. C.	2021	High School	No mention	Biology
Handayani	2019	High School	PicsArt	Physics
Friedlander, P.	2019	University	No mention	Hindi
Aulianisa, N.T.	2019	High School	Cartoon Story Maker	English
Wahyudin, A.Y.	2019	High School	Toondoo	English
Kohnke, L.	2021	University	Pixton	ESP
Gutiérrez	2022	University	No mention	ESP
Paisal, S.	2023	High School	Webtoon	English
Özdemir, E.	2016	Elementary	No mention	Science
Researcher-made	**Year**	**Target Audience**	**Design Tools**	**Domain**
Mamolo	2019	High School	No mention	Mathematics
Özdemir, E.	2010	Elementary	No mention	Science
Metraglia R. & Alia V.	2014	University	BitStrips	Engineering Graphics
Diah et al.	2019	High School	No mention	Science
Trimurtini et al.	2021	Elementary	Hand drawn	Mathematics
Kurt,	2021	University	Hand drawn	Social Science
Normiwalati et al.	2021	High School	Comic Page Creator App	Physics
Rina et al.	2020	Elementary	No mention-Flipbook software applications to transform digital comics into interactive	Character education
Kusrini et al.	2020	University	PaintTool SAI & Adobe Photoshop	Japanese Language Education
Radeswandri et al.	2021	University	No mention	University Promotion
Kavak & İlhan	2021	Secondary	Pixton	Social Science
Hapsari et al.	2022	High School	No mention	Physics
Nopita et al.	2022	Secondary	Medibang Paint	English
Firzana & Rasyida	2023	Elementary	Canva	Biology
Fatimah & Fatonah	2023	Elementary	Focusky	Science

Note: The table was developed by the researcher based on the literature review.

Table 2 presents limited information. It is imperative to conduct an extensive analysis including graduate theses and post-graduate dissertations in order to draw an accurate picture of comics created by teachers and researchers. While reviewing the relevant papers, the researcher experienced some problems that hindered the

presentation of necessary information. The study recommends that researchers in the field of educational comics identify the design tools used, include excerpts from their designs, and explain their exact roles in the creation of comics. The pertinent keywording, or a specific table dedicated to general information related to the design of educational comics will help audiences and potentially pave the way for further research. If these recommendations are followed, secondary researchers and reviewers can make healthier classifications, reach out more relevant papers, and conduct mature secondary research.

2.7. English for Design Purposes, Materials and Research

In most cases, the selection of the educational materials that will be utilized in the ESP class falls under the purview of the instructor of the ESP course (Basturkmen, 2019). This may involve selecting a course book or resources that are appropriate for the course, altering materials that are already available for a specific group, or producing new materials if none are already accessible.

In this conjuncture, ESP instructors are required to put forth considerable effort. Dudley-Evans and St. John (1998) identifies five key roles of an ESP teacher: "teacher; course designer and materials designer; collaborator; researcher, and evaluator" (pp. 6-7). According to Belcher (2009, as cited in Johns 2013), "ESP specialists accept the responsibility for finding out what their learners will likely need (and want) to be able to read, write, speak and comprehend as listeners to achieve their goals" (p. 5). There are also additional things to consider. As Prensky (2005) says, "As educators, we must take our cues from our students' 21st century innovations and behaviors, abandoning, in many cases, our own predigital instincts and comfort zones. Teachers must practice putting engagement before content when teaching" (p. 9).

However, some ESP teachers are luckier than others. The argument can be backed by analyzing available materials, bibliometric evidence of publication counts, and citation rates of ESP studies. To illustrate, Kohnke's (2021) study has been cited only once (March 2024). Thus, being a "English for Design" instructor entails all of the duties and responsibilities listed above, but one must also consider much more than this.

Business English is covered extensively in ESP, with a plethora of new, high-quality materials added and updated regularly. Lubina et al. (2015) discuss the dilemma faced by ESP instructors when selecting the most suitable coursebook from a plethora of options available in the market. This holds particularly true for ESP textbooks on medicine, aviation, law, engineering, as well as tourism and hospitality. Lesiak-Bielawska (2015) highlights that in established industries like banking or accounting, educators have access to a plethora of well-crafted ESP textbooks that are deeply rooted in current research and brimming with genuine data from the specific community or professional sphere. Conversely, this is not the situation in up-and-coming fields such as logistics or music, where the availability of tailored textbooks is exceedingly limited or non-existent (Lesiak-Bielawska, 2015). Design-related materials are more limited and encompass a broad spectrum of media and art topics in comparison to resources in aforementioned specifications. Table 3 illustrates the available ESP resources and their respective content.

Table 3. Available ESP Books for Design, Media and Art

International ESP Books for Design, Media and Art				
Title	**Year**	**Publisher**	**Author**	**Level**
Career Paths: Art & Design Book 1-2-3	2013 (1st edition) 2022 (2nd edition with *DigiBook App*)	Express Publishing	Evans et al.	A1-A2-B2
Cambridge English for the Media	2008	Cambridge University Press	Lee & Caramella	CEF Level B1
English for the Students of Fine Arts (Unavailable)	2023	Independently published	Bakhtiarvand & Oghyanous	Non-specified
National ESP Books for Design, Media and Art				
Title	**Year**	**Publisher**	**Author**	**Level & Notes**
English for the Students of Art	2016	Shiraz University Press	Khaghaninejad, M.S.	Non-specified Available for international students
English for Fine Arts Students	2013	Cherkasy National University	Kulish & Korolyuk	Non-specified Multilingual
English for the Students of Visual Arts (Painting, Graphics, Sculpture)	1997	Tehran: SAMT Publication	Ashki & Hosseini	Non-specified Multilingual
English for Art and Design Collage of Art and Design	2013	Teacher-made	Al-Ghamdi, R.	Non-specified Course Campanion

Note: The table was developed by the researcher based on the literature review.

This table yields significant insights. During our analysis of the content of these ESP books, it has become apparent that its breadth is substantial. Furthermore, the publication dates indicate a lack of coverage on current trends and emerging issues. In the analysis of pertinent courses on ESP (see *Chapter* 3), it was ascertained that *ILT 227 Professional English 1*, a mandatory ESP course provided by the Department of Communication Sciences at Cukurova University, includes "Cambridge English for the Media" as the designated course material.

Among the various publications listed in Table 3, the most pertinent one for ESP communication design students is "Career Paths: Art & Design", which has two editions. However, the researcher was unable to identify any changes in the scope while comparing the physical versions of *Career Paths* 2013 and 2022 editions. Each unit is two pages in length and typically shares the same language activities and organization. The second edition boasts the *DigiBook App*, allowing students to do activities and studies in a virtual environment. The following table demonstrates the information pertaining to the content of the book.

Table 4. The Content of *Career Paths: Art and Design*

Career Paths: Art & Design Book 1 A1	**Career Paths: Art & Design Book 2 A2**	**Career Paths: Art & Design Book 3 B1**
Unit 1: Describing Shapes	Unit 1: Art Movements	Unit 1: Education 1
Unit 2: Describing Light	Unit 2: Photography 1	Unit 2: Education 2
Unit 3: Describing Color	Unit 3: Photography 2	Unit 3: Business Types
Unit 4: Describing Placement	Unit 4: Photo Editing 1	Unit 4: Motion Design
Unit 5: Describing Style	Unit 5: Photo Editing 2	Unit 5: Editorial Design
Unit 6: Physical Materials 1	Unit 6: Fonts 1	Unit 6: Corporate Design
Unit 7: Physical Materials 2	Unit 7: Fonts 2	Unit 7: Music Industry Design
Unit 8: Electronic Equipment 1	Unit 8: Type and Lettering	Unit 8: Video Game Design
Unit 9: Electronic Equipment 2	Unit 9: Web Design 1	Unit 9: Information Design
Unit 10: Basic Actions 1	Unit 10: Web Design 2	Unit 10: Publishing Design
Unit 11: Basic Actions 2	Unit 11: Layout 1	Unit 11: Advertising Design
Unit 12: Sketches and Drawings	Unit 12: Layout 2	Unit 12: Environmental Design
Unit 13: Applied Arts	Unit 13: DTP 1	Unit 13: Interior Design
Unit 14: Graphic Arts	Unit: 14: DTP 2	Unit 14: Fashion Design
Unit 15: Fine Arts	Unit 15: CAD	Unit 15: Interactive Design
Glossary	Glossary	Glossary

Note: The table was gathered from the information from Career Paths: Art and Design, 2013, 2022. Source: Express Publishing. (n.d.). Career Paths - ESP English for Specific Purposes. Career Paths. Retrieved September 22, 2024, from https://www.careerpaths-esp.com/

Table 3 illustrates that the ESP textbook delves into various facets of art and design, encompassing a broad range of topics. A communication design ESP instructor could greatly enhance their teaching by utilizing this book in their classes; nonetheless, doing so will necessitate a willingness to invest extra time and the incorporation of a personal touch.

2.7.1. Review of Design-Related ESP Research

Design-related ESP research focus on needs analysis, program evaluation, material evaluation, and material design, with the latter gaining prominence in recent times. Kaur & Khan (2010) assessed the perspectives of 47 senior art and design students and ten faculty members regarding the current English language curriculum at a private college in Penang, Malaysia. While 64% of the students expressed that the materials incorporated in the English course were pertinent to their field of study, an English instructor involved in the study determined the shortage of materials tailored to fulfill the English language needs of the students at the academic institution. The researcher accentuated the fact that the majority of the materials were sourced from generic English textbooks and workbooks. The necessity for ESP resources in the field of art and design has also been emphasized in a more recent needs analysis study conducted by Sukarni and Imansyah (2022).

In the local setting, there was a lack of needs analysis studies specifically targeting communication design students. Therefore, the research is centered on closely associated disciplines. Ozyel et al. (2012) conducted a study to elucidate the requirements of seven students facing difficulties in both written and verbal communication as a result of their limited proficiency in the English language. The participants consisted of second and third-year students majoring in Radio, TV, and Film Studies within the communication department of a private university in Cyprus.

In her MA thesis, Kazar (2013) studied the perceptions and target needs of fifty-nine faculty of arts students at a private university. Six instructors also participated in the study. The study uncovered significant practical and empirical implications for the restructuring of the ESP program provided at the private university.

In 2014, Kazar and Mede conducted a study to ascertain the target requirements of eighty four students enrolled in the Faculty of Fine Arts at a prestigious private university. The results of their study underscored the significance of incorporating

both receptive and productive skill-based tasks and activities. Another prominent investigation conducted within a local setting was carried out by Kural (2019). This study focused on evaluating the revised ESP program provided by the Faculty of Fine Arts at Yeditepe University. The findings of this study underscored the program's ability to address the students' needs effectively. Additionally, the research unveiled that certain students encountered difficulties with top-down reading and comprehension tasks outlined in the updated curriculum. In this context, it is recommended that in addition to students' language proficiency levels, their prior knowledge should also be considered when introducing new reading materials. Correspondingly, feedback from students highlighted the necessity of implementing scaffolding techniques in ESP classroom tasks (Kural, 2019).

In an Iranian academic setting, Karimnia and Jafari (2017) examined the textbook "English for Students of Visual Arts" authored by Mehri Ashki and Mehdi Hossaini, edited by Hassan Rastegarpour, and initially published by SAMT in 1997. The textbook was assessed using the methodology and principles established by McDonough and Shaw (2003). In the study, semi-structured interviews were conducted with graduate students, English instructors, subject-specific instructors, and experts in visual arts courses such as painting. During these interviews, the researchers tried to investigate perceptions related to English language and ESP. The research outcomes underscored the necessity for the creation of novel ESP instructional materials in Iran, along with the overhaul of then current ones. Moreover, the findings reveal that conventional ESP resources and structures proved inadequate in addressing the linguistic requirements and specialized expertise of visual arts students.

Recently, Tunista et al. (2021) undertook a study to assess an English for Specific Purposes (ESP) textbook focused on art and design. The researchers examined a textbook called "English for Fine Arts" for Indonesian University art students studying English. Their research aimed to define and examine monologue texts and images of men and women in the textbook. The study evaluated written and visual content considering eleven expert theories. A checklist was employed to gather data and analyze gender representation in the ESP textbook. The research uncovered persistent gender disparities in the academic environment, the perpetuation of gendered cultural norms (male and female) through classroom discourse and the

textbook, as well as differential treatment of students based on gender. The findings from the survey indicated that gender portrayal in the ESP textbook at issue was inequitable.

Lucas Kohnke has undeniably made the most notable impact on the field of English for design through their extensive research and scholarly investigations. The researcher published their experiences with comics in design-related ESP classes in English as a Medium of Instruction (EMI) context (Kohnke, 2018). He also conducted a qualitative study on the use of student-generated and teacher-made comics in design-related ESP context (2021). In their studies, the researcher integrates technology and delves into multimodal methodologies for design-related ESP courses.

As stated earlier in subsection 2.3.2., Kohnke et al. (2021) incorporated infographics into the curriculum of "Professional English for Design Communication" at an EMI setting. A total of twelve participants were chosen for semi-structured interviews. The students expressed heightened levels of motivation and self-assurance in their language proficiency when utilizing infographics, as they found these assessments to closely mirror the professional situations they are likely to face in their future careers.

Kohnke also brings together various ESP fields in their studies. Kohnke et al. (2021) explored how well university students could remember specialized vocabulary from their academic fields when using a custom-made mobile app called *Books vs Brains@PolyU*. The study found that using the *Books vs Brains@PolyU* mobile app helped students remember more specialized vocabulary, especially at intermediate and advanced levels, compared to beginner and elementary levels. Despite the positive results, the study had limitations, such as the short one-month intervention period and the limited scope of the post-test. The researchers aimed to see if the app could help students learn and retain vocabulary words that are important for their specific disciplines, such as nursing, business, engineering, and design.

Upon examination of this corpus of literature, it becomes apparent that more empirical research is required to delve deeper into the field of English for design in non-major English contexts. First and foremost, the proliferation of design departments worldwide and the burgeoning fascination with design on an

international level are key factors fueling the necessity for further ESP research in these design departments. Especially, the study of English for design is apt to adopt a focus on multimodality, a key component in the education of the target ESP audience who strive for proficiency in various forms of communication through their in-depth education on the design of communicative components. This underscores the need for a comprehensive exploration of diverse multimodal materials, possibilities and their effects on reading skills of non-English majoring communication design students.

2.8. English for Design and Comics

Given that this thesis paper primarily focuses on the study of educational comics in English for design, it is important to comprehensively analyze primary research related to this domain. Based on available literature review, not all sources are visible based on search words. Thus, it is unable to offer a comprehensive analysis of the comparative results obtained from previous studies. Having identified a single emprical study in the field (e.g., Kohnke, 2021), the researcher expands the scope to encompass ESP and comics more broadly.

At the tertiary level of foreign language education, comics are effective tools for instruction that can help improve cognitive skills, enhance language abilities, and strengthen grammatical and lexical knowledge. It has been found that studying comics can enhance language learning and memory in ESP classes. Research has indicated strong connections between incorporating comics in educational settings and improved academic performance, such as heightened engagement and improved knowledge retention (Abda-Silva et al., 2017; Kohnke, 2018, 2021; Yanto & Umah 2023). This section discusses the scope and features of studying comics in ESP context. As a result of this objective, the researcher concentrated on physical comics, digital comics with or without interactive affordances, and comic strips in general.

2.8.1. Review of Related Studies

Kohnke (2021) investigated how using comic strips in English for specific purposes courses might make learning more enjoyable while also improving students' understanding of special vocabulary and ideas. In the study, comic strips were utilized during classes to assist students in learning new concepts and practicing

English through group projects and role-playing. Kohnke created short comic strips every week to review and reinforce important themes covered in design-related ESP classes. Students also made their own comics to demonstrate their comprehension of course themes, which were then posted on the course platform. The study involved ten university students and discovered that utilizing comics and technology in class increased student engagement and creativity in their learning. Kohnke (2021) emphasizes the significant role of integrating creativity and multimodality in specialized English courses throughout the research.

Vasileva and Golubev (2019) investigated the ways in which eco-comics can help Russian journalism students improve their English language skills and boost their knowledge of environmental issues. During the course of this research, first-year journalism students participated in an experimental case study in which they actively engaged with eco-comics in order to develop their English language skills and cultivate their knowledge of environmental issues. In order to acquire environmental vocabulary and develop visual scientific literacy, students participated in activities that involved speaking, writing, and creating comics based on environmental topics. Researchers discovered that eco-comics can make learning about the environment more fun and important by making the subject easier to understand. The research findings indicated that engaging with eco-comics enhanced students' comprehension of environmental issues and their ability to effectively convey ideas through the use of words and pictures.

Kusuwamati (2017) conducted a study on the use of comics in the education of mechatronics and electronics students specializing in English for Specific Purposes (ESP). The study involved 54 participants, who were divided into two cohorts. One cohort incorporated comics into their learning process, while the other cohort exclusively used text-based resources. The results indicate that integrating comics into reading instruction is a notably successful approach, especially in the context of university-level ESP subjects.

Huancayo (2021) conducted a study on the efficacy of utilizing comics as a tool to aid medical students in Peru in acquiring proficiency in the English language for their profession. The research employed pre-test and post-test assessments to evaluate enhancements in both oral and written communication skills.The research involved 19 medical students who participated in a series of 17 lessons using the

Presentation, Practice, and Product (PPP) method, and focusing on different anatomical structures and medical situations. The students used comics with empty speech bubbles to create and perform stories, enhancing their educational experience. The research revealed a marked enhancement in the English writing and verbal proficiency of medical students through the utilization of comics, as evidenced by their elevated scores in post-test vs. pre-test assessments for both written and oral competencies (Huancayo, 2021).

Gutiérrez (2022) conducted a sequential study where thirty senior dental students participated in an initial assessment to measure their proficiency in English. Subsequently, they engaged in a five-week English program that incorporated dental-themed comics. After completing the program, a follow-up assessment was conducted to assess advancements in both written and oral communication skills. The comics utilized in the study were designed by the researcher and involved students filling in dialogue bubbles to enrich their lexical and narrative skills, while also deepening their comprehension of dental anatomy and procedures. The quality of these stories was then evaluated to assess the students' English proficiency. Throughout the program, students engaged in both synchronous and asynchronous lessons to practice speaking and writing. Their voices were recorded and utilized to create witty dental consultation jokes. The study employed a survey to ascertain the students' motivation levels and conducted semi-structured interviews to gather qualitative data. The study concluded that the utilization of comics as an intervention significantly enhanced the writing, speaking, content development, paragraph structure, and vocabulary of the dental students. Also, the students' integrative and instrumental motivation exhibited an increase, suggesting that the comics not only enhanced their English skills but also heightened their enthusiasm and rationale for learning the language (Gutiérrez, 2022).

In another experimental study, Bai (2022) evaluated the use of comics as a method of teaching law students about the structure of English sentences. The study involved five different colleges and sixty students. Throughout the study, students who had engaged with comics evinced a greater level of creative writing aptitude and a better comprehension of sentence structure.

Due to the absence of any references to interactive comics in ESP literature, it is not possible to include a separate section dedicated to interactive comics. It is essential,

however, to make a reference to one project endeavour. Nieto and Yeste (2009) mention their ongoing graphic adventure project called “It’s a Deal!” to foster the intercultural communicative competence of business ESP learners. The aim of the project was to teach Spanish students about British culture and how to apply them in business English. The authors emphasize that the video game’s methodology is consistent with constructivist learning theory and it is expected to motivate learners.

The majority of existing evidence favors the incorporation of comics in ESP education overall. While Konkhe’s research (2021) achieved success in integrating comics into design-focused ESP courses within an EMI setting, it lacks robust quantitative data. Although qualitative evidence exists, it does not unequivocally endorse the use of comics for “English for Design” objectives, namely in non-English tertiary level settings. This highlights the need of studying comics in non-English majoring design departments. Moreover, it is noteworthy to mention that previous research on comics in ESP has predominantly concentrated on conventional and digital mediums as well as content created by students, overlooking the element of interactivity and share-alike educational content within ESP community.

It is also pertinent to acknowledge that given that a teacher’s level of training is an important factor in determining whether or not a technology is successful in an ESP classroom (Bloch, 2013). Success or failure is largely determined by the teacher. Undoubtedly, integration of interactive comics is also mainly dependent on the training and personal interest of an ESP teacher.

2.9. Summary of the Chapter

Beginning with a brief overview of the connections between constructivist epistemology and multimodal approaches in language learning, the present chapter investigated the significance of multimodal resources in the field of language education. It addressed the multimodal and interactive features of comics, focusing on their role and potential benefits in educational contexts, notably in higher education and ESP.

3. METHODOLOGY

3.1. Introduction

The objective of this chapter is to provide a comprehensive analysis of the many methodological decisions that were made in order to provide an answer to the research questions. A summary of the research framework and paradigm is presented at the beginning of the chapter. This is then followed by a discussion of the research strategy, and finally, a description of the data collection methods is provided. The chapter proceeds with a critical analysis of the research methodologies employed, especially with regard to research rigor principles. Following this, the chapter concludes with the design process of the teacher-made physical comic, "Norm(s) of Design Language" and its interactive version, *NDL 1.0*.

3.2. Research Design

This study utilizes a sequential explanatory mixed method design within a quasi-experimental study. The methodology includes sequential methodological triangulation following Creswell (1999) and Creswell et al. (2003). The methodology employs a deductive approach by first collecting quantitative data and then progressing to a qualitative stage to confirm or uncover unanticipated results. To establish an independent degree of interaction between data collection, the quantitative and qualitative strands were implemented individually, with their own research focus, data collecting, and analysis. As Greene (2007) argues, researchers only integrate the two strands when reaching conclusions near the end of the study.

Mixed methods research entails a researcher carrying out either a single study or a series of studies. It involves integrating qualitative and quantitative methodologies, approaches, and concepts (Creswell, 2003; Tashakkori & Teddlie, 1998; Johnson & Onwuegbuzie, 2004). Mixed methods research integrates quantitative and qualitative procedures in a unified framework to maximize the strengths of each methodology. Researchers mostly use a combination of strategies to choose methodologies and

approaches that are relevant to their established research questions (Creswell, 2003; Creswell & Plano Clark, 2018). Qualitative data is essential for interpreting, explaining, characterizing, and validating quantitative results in the analytical data convergent process (Creswell, 2003, Johnson & Onwuegbuzie, 2004; Tashakkori & Teddlie, 1998). In explanatory sequential mixed method studies, researchers change their post-positivist perspective to a constructivist one to elaborate on previously collected quantitative data (Creswell & Plano Clark, 2018). In order to fulfill this objective, the results are presented in a dedicated section, followed by the integration of data and a thorough discussion of the findings.

As this thesis tries to study the effects of the teacher-made physical comic and its interactive version on communication design students' professional language development, it employs its research design on two experimental research groups and uses basic-time series to evaluate materials effectively. A quasi-experimental two experimental group pre-test – post-test design with basic time series was chosen by the researcher for four reasons. For the population of the study, a stratified randomization based on university course schedules and programming was followed. Two groups of students enrolled in *ILT3931 English for Design* course were divided into categories: physical comic and interactive comic. The groups were assigned according to the technological equipment accessible to their members. Also, using a constructivist perspective, the researcher aimed to ensure impartial treatment and made the decision to omit a control group; instead opting to conduct a breadth of the research inquiry by including two separate experimental groups. In this regard, the absence of study on interactive comics was a determining factor in separating participants into distinct experimental groupings.

3.3. Setting and the Participants of the Study

The research was carried out at the Department of Communication and Design within the Faculty of Art and Design at Yıldız Technical University. The study was conducted face-to-face in departmental classrooms during the 2023-2024 Fall semester as part of *ILT3931 English for Design* course (see *Appendix* A for "Ethics Committee Approval" and *Appendix* B for "Informed Consent Forms").

The participants were junior communication design students enrolled in *ILT3931 English for Design*. Class sessions were offered in two optional groups during the course registration period. The first group was scheduled to meet on Mondays, while the other was scheduled to meet on Wednesdays (A detailed description of the participant students English levels can be found in *Chapter* 3 in *Figure* 11).

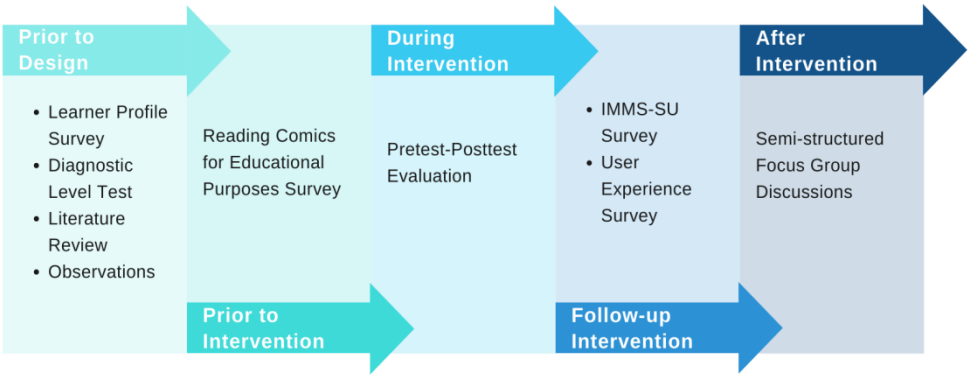
Table 5. ILT3931 English for Design Course Participants

Group 1 - Physical Comic	Group 2 - Interactive Comic
16 registered students	17 registered students
3 out of 16 no show	5 out of 17 no show
3 (two male and a female student) out of 16 dropped up the course after one-week attendance	1 (a male student) out of 17 dropped up the course after one-week attendance 1 (a female student) out of 17 dropped up the course after four-week of attendance
n10 = 7 female 3 male	n10 = 7 female 3 male
N = 20	

3.4. Stages of Data Collection and Instruments

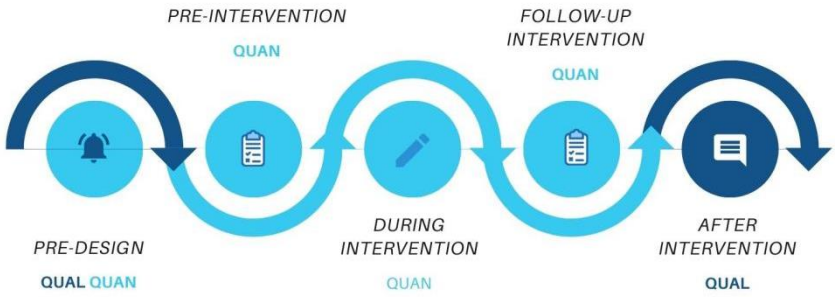
Data collection for this thesis is divided into five stages. After gathering preliminary information for the design of intervention materials, data collecting procedures for the mixed-method study were carried out. For the purpose of obtaining comprehensive data sets for the study, qualitative and quantitative data collection instruments were utilized respectively. The data instruments that were used throughout the process are presented in Figure 2 for the purpose of providing a better understanding of the techniques employed to collect data.

Figure 2. Stages of Data Collection and Instruments



In addition, Figure 3 is presented to elucidate the notation employed during the data collection process throughout the research. It offers detailed insight into the various categories of data collected during the study.

Figure 3. Data Collection Methods Notation



3.4.1. Pre-Design Phase and Before Intervention

The information gathered during the pre-design phase influenced and guided the researcher throughout the design of the intervention materials. In particular, the majority of the data given place in the transcription of this study is derived from and predicated on data collected during this phase. Information sources include research on the pertinent literature, an analysis of available ESP courses and materials for design, as well as muster of individual experiences and personal observations. In addition, a learning profile survey and diagnostic level test were utilized during the pre-design phase. These also served as practical instruments for analyzing participants throughout the quasi-experiment phase. A detailed analysis of the findings is provided in the 'Design Process' section of this chapter (see *Section* 3.8.)

3.4.1.1. Learning Profile Survey

The study used the learning profile survey in the "Outcomes Placement Test Package" offered by National Geographic Learning (n.d.). While it is meticulously crafted to aid course providers in accurately assessing students' proficiency levels and ensure they are placed in the "Outcomes" course that best matches their language

abilities and learning needs, the researcher has found it practically useful in understanding each student's strengths, weaknesses, and motivations. The questionnaire aims to gather information about each participant's language proficiency, educational background, language learning experiences, and motivations for learning English. It includes questions about reading and writing proficiency in the native language, previous English language study, duration of study, and reasons for learning English. Additionally, it questions a participant's preferred materials for reading, writing habits, and any questions they have about the course. Finally, it asks whether the student completed the English form alone or with assistance; and if assistance was provided, it requests the signature of the person(s) who helped (see *Appendix* C). The researcher has identified the utility of evaluating whether a student necessitates aid in filling out the form as a means to gain valuable insights into their linguistic requirements; potentially identifying areas in which the student could derive advantage from supplementary assistance throughout the duration of the course.

3.4.1.2. Diagnostic Level Test

Basturkmen (2019) highlights that English classes are usually organized according to students' proficiency levels, but classes in ESP courses may consist of students with different levels of competence due to the restricted availability of ESP programs in a particular subject area. In order to determine the proficiency level of the students and to ensure statistical control over both the homogeneity between groups and within groups, a diagnostic level test was administered to each group at the beginning of the semester. (see *Appendix* D). The test was developed by National Geographic Learning (n.d.) and consists of 50 multiple-choice questions. The test was administered to students in person during class hours.

3.4.1.3. Personal and Classroom Observations

This study used observations to achieve three key goals. The reasons include evaluating the process of assessing students' language levels using Common European Framework of Reference (CEFR) standards and comparing those levels to diagnostic level test results, determining students' needs in the pre-design phase, and identifying areas that may affect the research during material intervention.

3.4.1.4. Reading Comics for Educational Purposes Survey

The survey consists of eight Likert scale questions with six response options, ranging from “very poor” to “very good”. It mainly assesses students’ perspectives on leveraging comics to enhance their professional knowledge and examines participants’ attitudes towards comics and the integration of comics into formal educational contexts (see *Appendix* E). It investigates whether they believe comics can serve as effective instructional materials and whether they are receptive to the idea of using them for educational purposes. The survey commences with a general question about attitudes, then progresses to inquire about various aspects related to reading comic books, such as gaining knowledge, language improvement, and educational use, both digitally and in print.

- How do you feel about reading comics in your spare time?
- How do you feel about the idea of gaining knowledge from comics?
- How do you feel about the idea of improving your English by reading comics?
- How do you feel about enhancing your professional knowledge through reading comics?
- How do you feel about the idea of reading a comic book as a textbook?
- How do you feel about the idea of reading a digital comic in class?
- How do you feel about the idea of reading an interactive digital comic in class?
- How do you feel about the idea of reading a physical comic in class?

The survey was incorporated into the research subsequent to an evaluation of its reliability. According to the preliminary results of Hobart et al. (2012), reliability estimates based on sample sizes of at least 20 were found to closely mirror the characteristics of the main study sample size of 713. Nevertheless, additional statistical examinations are necessary to authenticate the survey. To achieve this, the analysis will be carried out on a broader sample size and subjected to confirmatory factor analysis. Consequently, this study can be considered as an initial phase of the ensuing evaluation.

3.4.2. Pre-Test–Post-Test Evaluation

The intervention materials comprised three chapters; each of which underwent its own pre-test–post-test evaluation. Each evaluation contained five fill-in-the-blank questions related to design specific vocabulary and concepts. The researcher also considered possible distractor words and avoided the use of indicators presented by singular and plural verb forms when compiling the questions (see *Appendix* F).

To ensure the test's validity, students in both groups were asked not to use dictionaries or cell phones while taking tests. The teacher-researcher acutely informed students about the factors that influence validity in academic research and attempted to prevent them from being excited and anxious about testing. In addition, the teacher monitored the students sufficiently to ensure participant anonymity.

3.4.3. Follow-Up Intervention

Follow-up surveys were conducted to examine students' learning experiences at the end of the first and second interventions.The selection of scales was influenced by the students' native language, and surveys deemed pertinent to addressing research inquiries were employed. All ethical considerations were taken into consideration and the scales were utilized with the approval of the scale developers (see *Appendix* G).

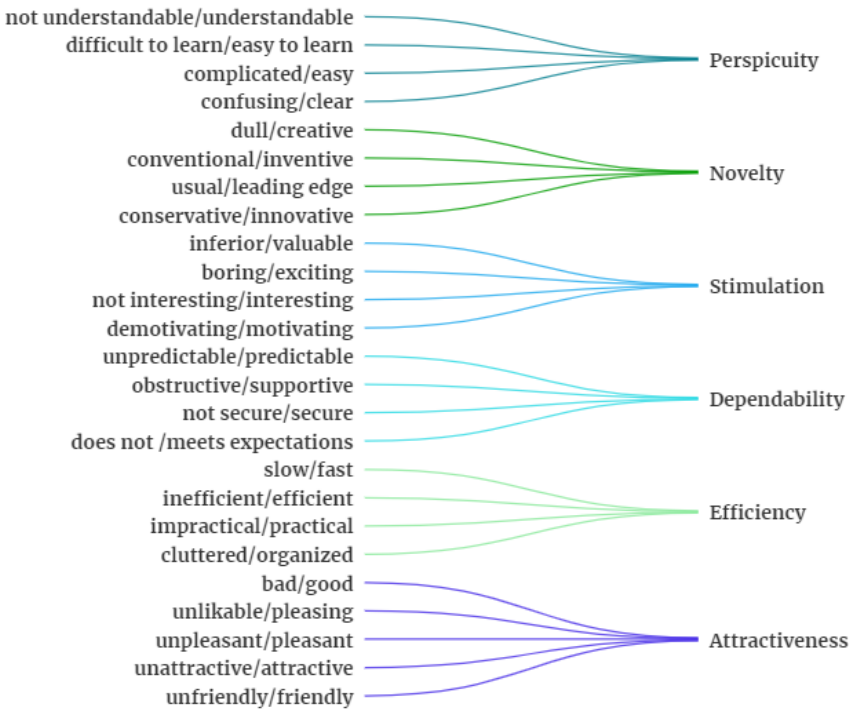
3.4.3.1. Instructional Material Motivation Survey

Instructional Material Motivation Survey for a Single Use (IMMS-SU) specifically designed to evaluate the motivation for an instructional material when students are just exposed to it and based on a single instance of application (see *Appendix* H). The scale consists of a total of fourteen questions and developed in Turkish language by Barut and Dursun (2021). A higher score on the scale indicates that the students have a strong level of motivation toward the instructional material being evaluated (Barut & Dursun, 2021).

3.4.3.2. User Experience Questionnaire

The User Experience Questionnaire (UEQ) offers a comprehensive comprehension of the user experience (Laugwitz et al., 2006, 2008). The evaluation includes both conventional usability criteria, such as Efficiency, Clarity, and Reliability, as well as elements of user experience, such as Novelty and Stimulation (Schrepp, 2023). The objective of this analysis is to offer insights into the perceptions of students in both experimental groups regarding different aspects of the user experience, including average ratings and rating variability. Gaining a deeper understanding of the strengths and weaknesses of the user experience of the teacher-made comics can be achieved through comprehending the quality of the experience across different attributes (see *Appendix* I).

Figure 4. UEQ Items and Attributes



Note: The figure was adapted from "User Experience Questionnaire Handbook", Schrepp, 2023, p. 3.

More than thirty different languages are supported by the UEQ. A slight modification was made to the Turkish version of the UEQ for the purposes of this study. The word "adi" was replaced with the word "bayağı" in the scale. The developers of the scale were also given feedback and recommendations regarding the modification of the wording.

The UEQ can be used to evaluate both static and dynamic designs. The questionnaire includes its own data analysis tool. The tool computes all the statistics required for interpretation of the results. The instructions are available in many languages. For this study, the researcher made use of English instructions in the data analysis tool.

3.4.4. After Intervention

Given the nuanced nature of mixed method research inquiries, qualitative data was collected through semi-structured focus group discussions in the course of this current study. By employing diverse data collection methods throughout the research process, it becomes possible to compare data gathered under various conditions and with various instruments in relation to the phenomenon being studied. While

different forms of data influence one another in this context, their precision and consistency can be evaluated. The research utilized focus group discussions that were specifically designed to elicit information that quantitative data would be unable to disclose. In addition to the primary research question, the researcher endeavored to gather and evaluate the viewpoints and suggestions of communication design students regarding the prototype of teacher-made physical comic and its interactive version, both as users and informants, during the focus group discussions.

3.4.4.1. Focus Group Discussions

The interview questions were presented to five junior communication design students who did not take the course to solicit feedback and recommendations. Following confirmation that the questions were comprehensible and reliable, a protocol was formulated for each interview (see *Appendix* J).

The researcher provided prior notification of the interview session, resulting in substantial participation from both groups. Group discussions were conducted in-person during class hours. After around ten weeks of collaborating with the students, the researcher concluded that it was unnecessary to screen them for focus group discussions. This would also help to ensure the dependability of the research; it is crucial to include the perspectives and suggestions of all group members in the focus group discussions to the greatest extent. In the physical comic group discussion, there were nine students, whereas in the interactive comic group, all participants were present. The group discussion period of the physical comic group spanned a duration of 37 minutes, while for interactive comic group it was 43 minutes. The researcher conducted interviews as outlined in the interview protocol and adhered to Jacog and Furgerson's (2012) recommendations for conducting group interviews and drafting the interview protocol. The researcher utilized multiple recording devices to address potential technical challenges; three devices were strategically positioned based on the seating arrangements of the participants. After reading the interview protocol, the researcher proceeded to ask the focus group discussion questions.

Following the transcription of the interviews, three students from each group were asked to scrutinize the transcripts. This step was taken to authenticate the precision and dependability of the transcriptions derived from the interviews.

3.5. Data Management and Analysis

The researcher utilized open source software and applications in order to carry out the data analysis. For the purpose of ensuring that the present study was carried out in a way that was both reliable and dependable, a considerable amount of attention was paid to the storage and management of the data. After the data collection process, the scales and tests underwent evaluation and were manually transcribed into Excel spreadsheets. The data was managed and stored via cloud storage. The surveys and assessments were scanned and archived as distinct files (see *Drive Link:* https://drive.google.com/drive/folders/1tMA0M6m7Vo_nHSr7ylWO1rOI4C_Fc6Rf?usp=drive_link).

3.5.1. Quantitative Data Analysis

In this study, the researcher analyzed quantitative data using *Jamovi* (version 2.4.11), an open source statistical software. The researcher made use of various modules available at *Jamovi* library to conduct their analysis. The quantitative data analysis techniques outlined in Table 6.

Chosen Significance Level and Confidence Interval for the Present Study

The significance level, often represented by the symbol α (alpha), plays a crucial role in inferential statistics by serving as the threshold for determining statistical significance (Kraft, 2020). Commonly used values for the significance level include $\alpha = 0.05$, $\alpha = 0.01$, and $\alpha = 0.10$, but other values can be selected based on the specific context of the analysis (Field, 2012). The significance level is typically predetermined, such as $\alpha = 0.05$, and if the p-value is less than or equal to α (Field, 2012). When the calculated p-value is less than or equal to the significance level ($p \leq \alpha$), it indicates that the observed results are statistically significant at that level. In this study, the significance level is set at 0.05, and all inferential tests, whether parametric or non-parametric, are evaluated based on this chosen level of significance.

On the other hand, a confidence interval is a range of values centered around a sample statistic, like a mean or proportion, that is expected to encompass the true population parameter with a specific level of confidence (Jupp, 2006). The confidence level, typically denoted by $1 - \alpha$, represents the likelihood that the

calculated confidence interval contains the true population parameter. Common confidence levels are 90%, 95%, and 99%. For instance, a 95% confidence interval for the population mean suggests that if we were to repeatedly draw samples from the population and compute confidence intervals, approximately 95% of those intervals would capture the true population mean (Jupp, 2006). Despite being infrequently used, a confidence level of 95% was set for all parametric tests in this study.

Table 6. Quantitative Data Analysis

Data Collection Instruments	Inferential Tests	Descriptives	Data Analysis Tools
Diagnostic Level Test	Levene Test (Levene, 1960)		*Jamovi*
Reading Comics for Specific Purposes Survey (RCEP)	Kolmogorov–Smirnov (Massey, 1951)	Mean Variance Standard Deviation Reliability Analysis-The Alpha-Coefficient (Cronbach, 1951)	*Jamovi*
Pretest- Posttest Evaluation	Shapiro–Wilk (Shaphiro & Wilk, 1965) Paired Sample T- Test Non-Parametric Wilcoxon Test for each group Independent Sample T- Test & Non-parametric One-way ANOVA (Kruskal-Wallis) for group comparison	Mean Variance Standard Deviation	*Jamovi*
Instructional Material Motivation Survey (IMMS-SU)	Levene Test (Levene, 1960) Shapiro–Wilk (Shaphiro & Wilk, 1965) Independent Sample T-Test Non-parametric Mann-Whitney U-Test (Mann & Whitney, 1947)	Mean Median Standard Deviation	*Jamovi*
User Experience Questionnaire(UEQ)	Two sample T-Test assuming unequal variances Levene Test (Levene, 1960) Shapiro–Wilk (Shaphiro & Wilk, 1965) Welch T-Test (Welch, 1947) Non-parametric alternative of Independent Sample T-Test Mann-Whitney U-Test (Mann & Whitney, 1947)	Mean Variance Confidence Intervals	*UEQ Excel Data Analysis Tool* (Schrepp, nd.) J*amovi*

Descriptives

Researchers who are analyzing data from a quasi-experiment use a variety of statistical approaches, such as calculating the mean and standard deviation, to arrive at conclusions (Eliopoulus et al., 2007; Schweizer & Furley., 2016; Armstrong & Patnaik, 2009).

Homogeneity Test

The Levene test is used in quasi-experimental designs to determine whether variances are equivalent across groups or circumstances. It is widely used in conjunction with other statistical methods to support assumptions about variances in studies including pre-test and post-test evaluations, such as those investigating the effectiveness of educational interventions or training programs (Nordstokke & Zumbo, 2010; Nordstokke et al., 2011). The Levene test ensures the validity of group comparisons by checking for variance homogeneity, which is especially useful when dealing with non-randomly assigned individuals in quasi-experimental studies (Delacre et al., 2017). This test is critical for lowering challenges to internal validity and increasing the credibility of cause-and-effect conclusions derived from non-randomized studies (Hoekstra et al., 2012). It is particularly useful when the assumption of homogeneity is required for subsequent statistical analyses, such as parametric tests including t-tests and ANOVA (Hoekstra et al., 2012).

Normality Tests

The Shapiro-Wilk test is a statistical test utilized to evaluate the normality of a data distribution. More precisely, it examines whether a specified sample is derived from a population with a normal distribution. This test holds particular significance when the assumption of normality is required for subsequent statistical analyses, such as parametric tests including t-tests and ANOVA (Hoekstra et al., 2012).

The Kolmogorov-Smirnov test exhibit greater robustness to variations in sample size compared to other normality tests across all circumstances (Ahad et al., 2011; Kundu et al., 2011). In quasi-experiments, the Kolmogorov-Smirnov test is utilized to evaluate the degree to which data conforms to a particular distribution without assuming the form of the distribution (Dreznel et al., 2010). When it comes to determining whether or not two datasets have the same distribution, this non-parametric test is helpful in determining whether or not the data follows a fixed distribution (Dreznel et al., 2010). On the other hand, the Shapiro-Wilk test is a parametric test that involves comparing the data to a normal distribution in order to determine whether or not the data is normal (Hendri et al., 2021). Additionally, the Shapiro-Wilk test is dependent on the assumption of normality, but the Kolmogorov-Smirnov test does not require any prior knowledge of the distribution form itself

(Hanusz & Tarasińska, 2015). The Kolmogorov-Smirnov test is more flexible to other types of distributions than the Shapiro-Wilk test, which is designed for normality checks (Hanusz & Tarasińska, 2015). Both tests are significant in statistical analysis when it comes to determining whether or not a distribution is normal.

Reliability Testing

Cronbach's alpha, often known as the *Alpha-Coefficient*, is a reliability measure used extensively in the social sciences (Cortina, 1993; Green, 2003). It evaluates the internal consistency of scores generated from several items or scales. Cronbach's alpha has always assumed that variables are continuous (Cortina, 1993). Cronbach's alpha is calculated by determining the average correlation between all possible item combinations on a scale, while accounting for both total score variation and average inter-item correlation (Greco et al., 2018). This coefficient is one of the most significant aspects to consider when assessing the precision and consistency of measurement materials throughout a wide range of study topics (Green, 2003).

Comparative Analysis and Other Inferential Tests

A paired sample t-test is used in quasi-experiments to compare the mean of a single group before and after an intervention (Ross & Willson, 2017). This statistical test is especially effective in quasi-experimental designs, such as pretest-posttest investigations, in which measurements are collected from the same individuals at various periods in time (Zimmerman, 1997). Its non-parametric counterpart, Wilcoxon signed rank test, particularly useful when the data does not meet the assumptions required for the paired t-test, such as when the data is not normally distributed (Corder &Foreman, 2014).

The Mann-Whitney U-Test, a non-parametric counterpart of the independent sample t-test, is useful for comparing the distributions of two independent groups, especially when the sample sizes are small or the data are not normally distributed (Nachar, 2008). The Welch t-test is a robust parametric option for comparing independent samples; it can handle non-normally distributed data and unequal sample sizes (Lutsky, 1990).

ANOVA assists in detecting significant differences among population means by assessing variances between and within groups, which is an important feature of

quasi-experimental research to determine the influence of treatments or interventions (Shadish & Luellen, 2005; Ross & Wilson, 2017; Wiley & Bock, 1967). The rationale for employing non-parametric one-way ANOVA in quasi-experimental designs is that it can evaluate data where two or more independent groups are exposed to several treatment conditions, resulting in repeated measurements (Corder et. Al, 2014). This technique is critical for controlling the correlation among these repeated measures, which classic ANOVA cannot do successfully (Ostertagova et al., 2014).

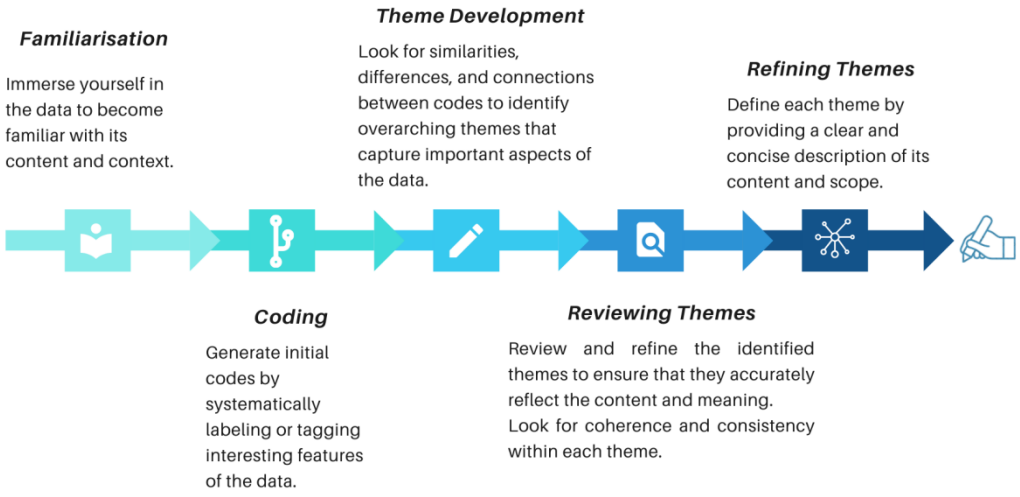
3.5.2. Qualitative Data Analysis

For this study, the researcher conducted thematic analysis through *Taguette* (Rampin & Rampin, 2021), an open-source qualitative data analysis tool, and followed the framework offered by Braun and Clarke (2006, 2012, 2019). This framework provided a comprehensive and flexible structure for identifying, analyzing, and documenting patterns observed during the examination of the focus group discussions (see *Figure* 5).

To conduct thematic analysis effectively, a mere data summarization is insufficient. (Braun & Clarke, 2019, 2021). Braun and Clark's thematic analysis approach prioritizes adaptability and self-awareness, allowing researchers to tailor the process to their specific research needs while maintaining rigorous standards of data analysis and interpretation. The principal objective of performing a thematic analysis is to initially decipher significant or meaningful patterns within the data, and then subsequently employ these patterns to address specific issues or provide answers to research inquiries. Additionally, Clarke and Braun (2013) strongly advise against using primary interview questions to identify research themes.

Codes and themes have an important place in thematic analysis. Rather than being subject to ready definition, a good code or theme is suggestible. Boyatzis (1998) provides a description of a good code. According to Boyatzis (1998), "a good code is capable of providing an accurate representation of the phenomenon's qualitative richness" (p. 1). According to Braun and Clarke (2006), the definition of a theme is not predetermined by any fixed criteria; the distinctiveness of a theme is attributed to its significance.

Figure 5. Six-Phase Analytic Process of Thematic Analysis



Note: The figure was adapted from Terry et al., 2017, pp.17-31 in Thematic analysis. In Willig, C., & Rogers, W. S. (Eds.). The SAGE handbook of qualitative research in psychology.

3.6. Research Rigour Principles and Variables

In this study, attempts were made to miximize issues that could jeopardize the rigour of the study itself. Table 7 presents various variables in the study.

Table 7. Variables of the Study

Independent Variables	Dependent Variables	Confounding Variables	Intervening Variable
Group 1: Teacher-made physical comic Group 2: Interactive version of teacher-made comic	Professional Language Development Students' Perceptions and Learning Experiences	Instructor characteristics Group dynamics Prior knowledge Psychological factors and situational impacts Students' previous reading attitudes towards comics	Reading habits

Confounding variables were treated meticulously to prevent their direct impact on the independent and dependent variables of the current study (see *Table* 8). In this particular case, the teacher factor was defined as a confounding variable, and no

teaching was incorporated into the classroom interventions to eliminate mediating and moderating impacts on the dependent and independent variables.

Table 8. Controlled Variables in the Study

Controlled Variables	Threat	In the Current Study
Direct instruction or teaching methods during intervention	Teaching style and instructors' individual differences may threat both internal and external validity of the study.	Not included in the study during interventions Formative feedback was provided following each intervention.
Students' reading attitudes towards comics	Students' personal attitudes towards comics may have a direct impact on their perceptions and experiences; it has	A poll-like survey was conducted before interventions to analyze the attitudes of the students.

The actions outlined in Table 9 aim to ensure the validity and reliability of the research findings by addressing key factors that could influence the outcomes. These actions contribute to the rigor and validity of the research by minimizing potential sources of bias and ensuring that the data collected accurately reflect the effects of the interventions or variables under study.

Table 9. Applied Strategies to Minimize the Impact of Confounding Factors

Group dynamics	Are the groups homogeneous?	Conduct a diagnostic level test and check the homogeneity of the groups. Make use of direct observations to analyze group characteristics.
Prior knowledge	What if my students have already known the target-terminology and concepts in English?	Check the pretest scores of the students and compare them with their post-tests results.
Psychological factors and situational impacts	How can I minimize the confounding effects of psychological factors and situational impacts?	Preserve anonymity by coding. Deliver tests and surveys in sealed envelopes. Make direct observations during interventions to define situational impacts.
Group dynamics	Are the groups homogeneous?	Conduct a diagnostic level test and check the homogeneity of the groups. Make use of direct observations to analyze group characteristics.
Prior knowledge	What if my students have already known the target-terminology and concepts in English?	Check the pretest scores of the students and compare them with their post-tests results.
Psychological factors and situational impacts	How can I minimize the confounding effects of psychological factors and situational impacts?	Preserve anonymity by coding. Deliver tests and surveys in sealed envelopes. Make direct observations during interventions to define situational impacts.

To ensure a smooth research procedure, the researcher-teacher managed essential steps and supervised the students throughout the intervention process. Regarding the pre-test- post-test applications, they ensured that students responded to the questions solely based on their knowledge and took steps to reduce any threat that could have influenced the dependent variable. After each application, they offered the students feedback on their work.

To promote a steady and healthy implementation process, customized lesson plans were created for each group, and predetermined measures and strategies were defined to handle any technical or procedural issues and challenges. The inspiration behind these lesson plans came from Yin's case study research protocol (2009). The lesson plans functioned as a research protocol additionally contribute to the preservation of research quality and rigor, while minimizing uncertainty and the need for revisions. They offer a comprehensive set of recommendations and guidelines to the researcher to facilitate a meticulous data gathering process and ensure the acquisition of all essential information (Yin, 2009).

Additionally, an interview protocol was designed to guide the teacher-researcher during focus group discussions (see *Appendix* J, mentioned earlier in 3.4.4.1.). According to Creswell and Creswell (2018), interview protocols assist researchers in designing and implementing their investigations, maintaining the research and the consistency of the data collection procedure.

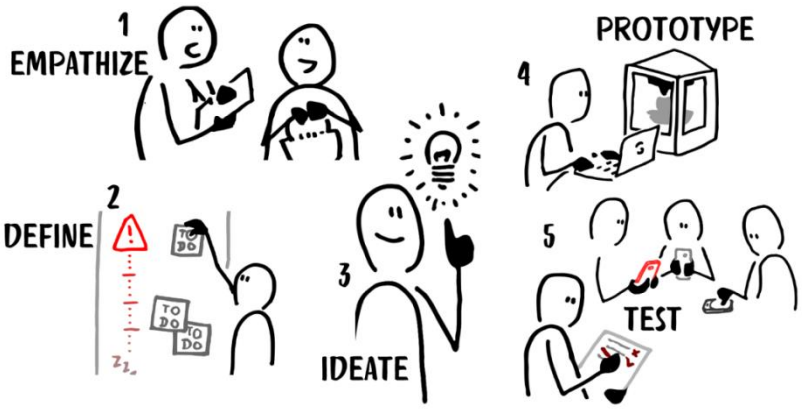
3.7. Design Process: Design Thinking Process and Ten Steps of Motivational Design

This section aims to provide an in-depth analysis of the data gathering approaches and design choices within the five-phase model of design thinking introduced by the Hasso-Plattner Institute of Design, d. school (see *Figure* 6).

Stanford University's Hasso-Plattner Institute of Design, commonly referred to as the d.school, has gained significant acclaim for its pioneering and transformative approach to design thinking (Meinel & Krohn, 2022). Carlgren et al. (2016) highlight the intricacies involved in researching and studying design thinking, particularly due to the discrepancy between its theoretical and applied interpretations. Design thinking is a methodology that encompasses a wide range of iterations and

approaches (Lewrick et al., 2020; Luchs, 2015). These iterations can vary depending on the specific problem being addressed, the goals of the design process, and the preferences of the design team (Goldschmidt & Rodgers, 2013). Some common stages of design thinking include empathizing with users, defining the problem, ideating potential solutions, prototyping ideas, and testing them with users for feedback (Razzouk & Shute, 2012). Each stage is essential in the design thinking process as it helps to ensure that the final solution is user-centered, innovative, and effective. By delving into various manifestations of design thinking, designers can acquire fresh perspectives, unearth distinctive possibilities, and ultimately develop more profound and significant solutions for their users (Dorst, 2015).

Figure 6. Hasso-Plattner Institute of Design, d. school, Model of Design Thinking Process



Design thinking empowers students, professionals, and organizations to tackle complex challenges with empathy, creativity, and innovation through its iterative process, resulting in impactful and human-centered design solutions that address constructivist approaches and solutions (Pande & Bharathi, 2020). Archer and Newfield (2014) state, “A multimodal approach foregrounds the principle of design in the making and production of meaning rather than the acquisition of received knowledge” (p. 5). Bearing this in mind, the researcher initiated their investigation with the following question: “How can I make use of the comics medium in the making and production of meaning in English for Design education?” To contemplate this inquiry, the study employed the framework of the design thinking process developed by d. school. This involved a series of steps including

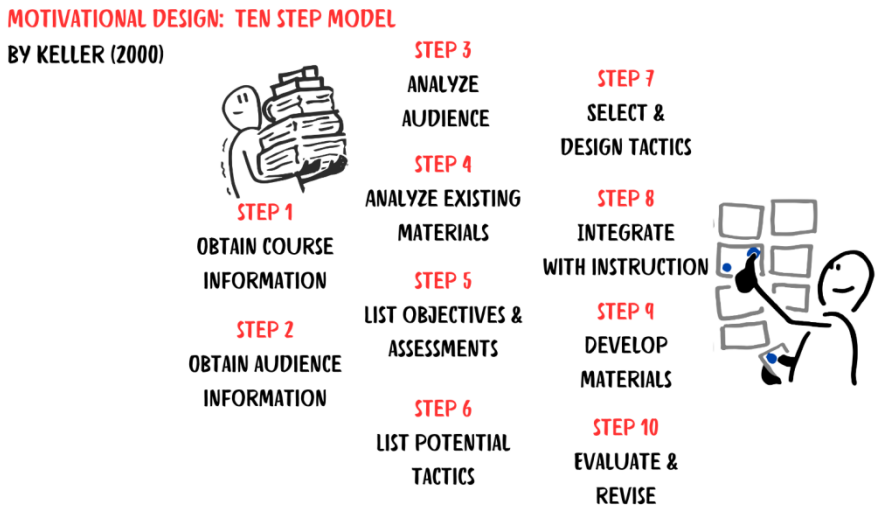
empathizing with users, defining the problem at hand, ideating potential solutions, prototyping ideas, and testing them with real users (Micheli et al., 2019).

In the empathize phase, designers try to engage in the user's perspective to gain a deep understanding of their needs and challenges. In the define phase, designers synthesize the information from the empathize phase to clearly define the problem statement. The ideate phase generates a diverse range of ideas to address the defined problem. Prototyping involves creating representations of the proposed solutions to gather feedback and iterate on the designs. Lastly, the test phase involves testing prototypes with users to gather insights and refine the designs further. The d.school's design process emphasizes human-centered design and iterative prototyping to create innovative and effective solutions.

While preparing teacher-made comics, the design thinking process combined with the ten steps of motivational design offered by Keller (2000). It is a systematic process that can be applied in a number of educational settings. During the preliminary design phase and initial brainstorming stage, the researcher utilized it as a reference rather than a central method and endeavored to incorporate it into the design thinking process. The ten steps of motivational design guided the teacher-designer towards various crucial factors to contemplate in their intervention material design (see *Figure* 7).

The first step involved conducting an inquiry into the components of the course. The second step involved the collection of necessary details regarding the previous experiences of the audience, as well as their attitudes toward the course and their current skill levels. Attempts were made to determine the target students' motivational levels in the third step through the utilization of a learning profile survey and classroom observations. In the fourth step, existing materials were analyzed. Available materials were weighed and their possible benefits and drawbacks were outlined. Objectives, instructional methods, and assessment were listed in the fifth step.

Figure 7. Motivational Design: Ten Step Model by Keller (2000)



The figure was adapted from Keller, 2000.

Figures 8 & 9 depict the various stages encompassed in the design process.

Figure 8. Empathize and Define Phase of the Teacher-Made Comics

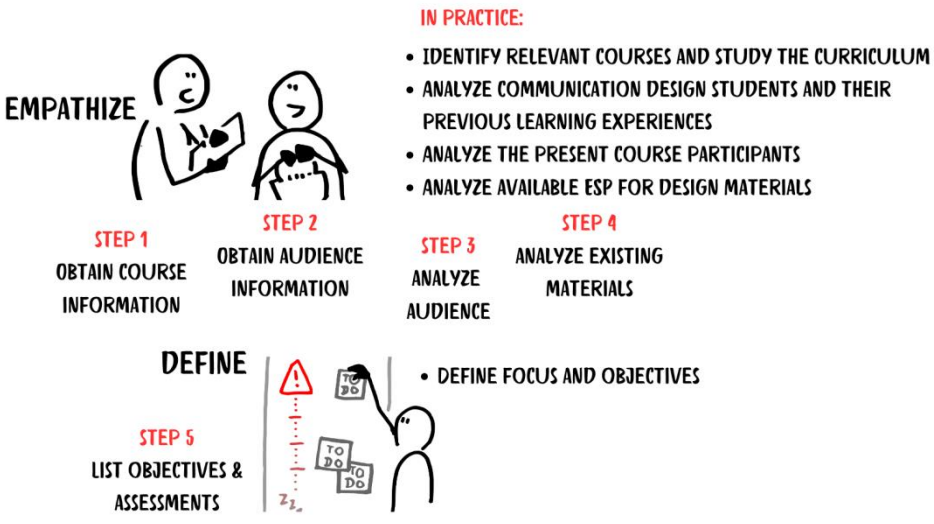
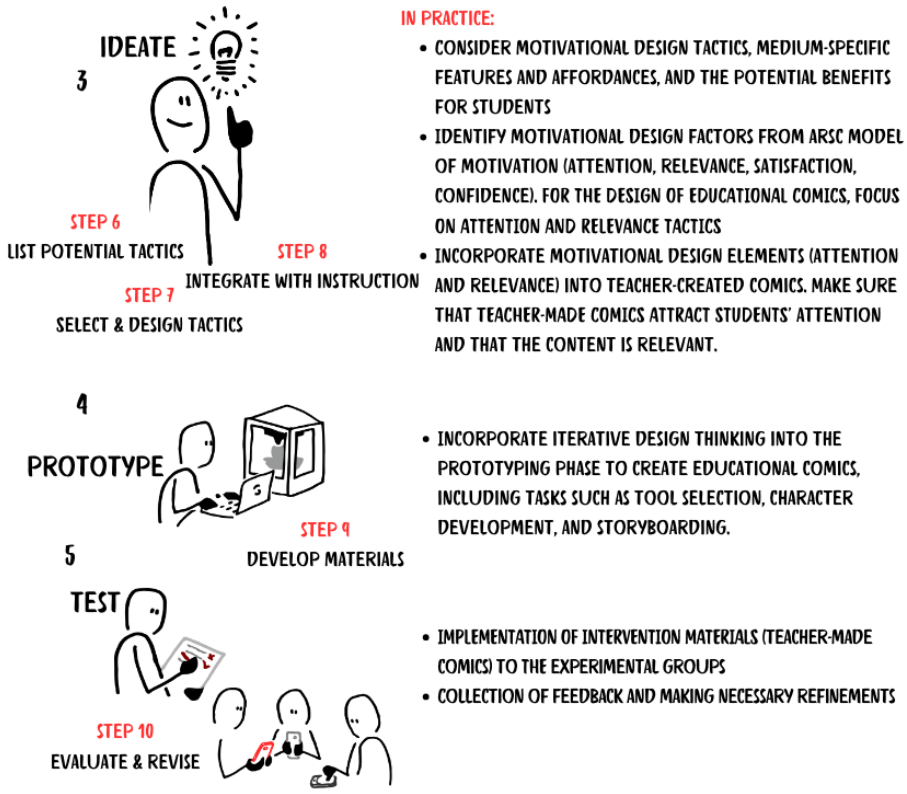


Figure 9. Ideate, Prototype & Test Phase of the Teacher-Made Comics



As shown in Figure 9, in ideate phase of the design, a list of prospective strategies was compiled, with the assistance of brainstorming and empathy mapping for each of the ARSC model categories (attention, relevance, satisfaction, and confidence); especially those related to “attention” and “relevance”. As suggested in the six step, the researcher focused on two questions offered by Keller (2000): (i) “How can I make this learning experience stimulating and interesting?”; (ii) “In what ways will this learning experience be valuable for my students?” (p. 45). The first question addressed issues related to attention, whereas the second question addressed concerns about relevance. In the seventh step, design strategies were chosen with consideration given to restrictions such as time, resources, and other factors. The eighth step involved incorporating the chosen strategies into the design. In the ninth step, prototypes were developed. During the tenth step, the high-fidelity prototype was assessed and tested for its effectiveness within the framework of a quasi-experiment by collecting feedback from students to determine their level of satisfaction and the need for refinement.

The rest of this section deals with the ‘empathize and define’ and ‘ideate and prototype’ steps while the ‘test’ step is elaborated in “Procedures of the Quasi-Experimental Study” section (see *Section* 3.9.). In order to take the first-two steps in design thinking process, the study identified relevant courses, studied their curricula, and analyzed available ESP design materials. Following this, an analysis was made of communication design students and their previous learning experiences. Then, the study focused on investigation of the course participants. The thesis subtitle of “Ideate and Prototype” attempts to illustrate design decisions and the prototyping procedure.

3.7.1. Empathize and Define

Analysis of Relevant Courses and Materials

Many universities in Türkiye offer design programs at both undergraduate and postgraduate levels. These programs play a crucial role in nurturing creative talent, promoting design innovation, and contributing to the growth of the design sector in the country. Notable institutions with design departments include Istanbul Technical University, Middle East Technical University, Bilkent University, Istanbul Bilgi University, Sabanci University, Mimar Sinan Fine Arts University, and Yildiz Technical University. Additionally, vocational schools and private design institutes also offer design programs with a practical focus. The departments encompass several fields such as graphic design, industrial design, game design, new media, animation, visual communication design, and others.

The Communication and Design Bachelor’s program at Yildiz Technical University is the first degree program in Türkiye to be offered in the field of media design (Ertan, 2013). In addition, thirteen private and five state universities offer degree programs in communication and design (see *Table* 10). It is noteworthy to mention that a mere four of these private universities offer their degree programs in the English language. One private university offers an English-major communication arts program. In addition, there are two public programs in Turkish and one private program in English specializing in communication design and management.

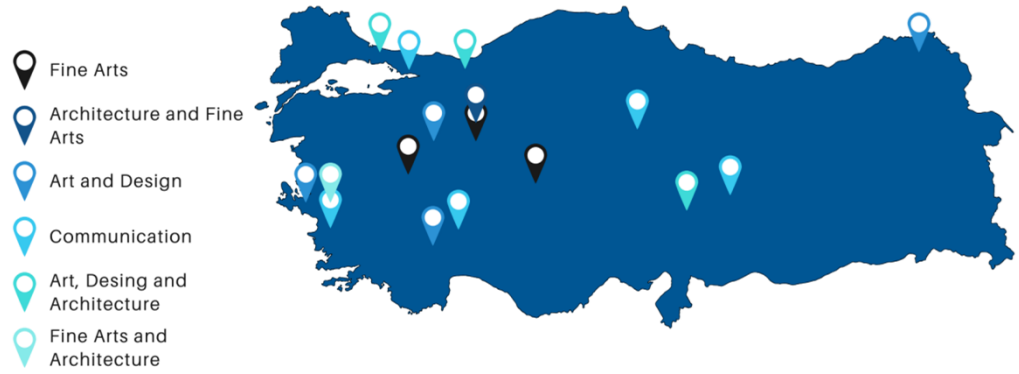
Table 10. Communication Design Departments at State Universities in Türkiye

University	Faculty	Minor English	Language of Instruction
Yildiz Technical	Art and Design	No	Turkish
Sakarya	Communication	No	Turkish
Trakya	Fine Arts	No	Turkish
On Dokuz Mayis	Communication	No	Turkish
Tokat Gaziosmanpasa	Social Sciences and Humanities	No	Turkish

Note: The data was collected from the website of Yokatlas in September 2024.

According to data retrieved from the website of Yokatlas in Septemer 2024, seventeen state institutions in Türkiye contain departments that are entirely devoted to the field of visual communication design (see *Figure* 10). In addition, there are twenty-nine private universities in Türkiye and four in K.K.T.C. that offer degree programs in visual communication design. The majority of private universities in the country offer their visual communication design programs in Turkish, whereas only seven offer their degree programs in English.

Figure 10. Visual Communication Design Departments at State Universities in Türkiye



Note:The data was collected from the website of Yokatlas in September 2024..

That said, the purpose of the current study is not to discuss the abundance of such programs, but to underline the need in this regard by focusing on the language of instruction and design-related ESP courses in the curriculum of Turkish state universities. This information highlights the significance of ESP courses in non-English major communication design-related departments in Türkiye for various reasons (see *Tabl*e 11 & 12).

Except for Firat University, Kocaeli University, and Malatya Turgut Ozal, none of the visual communication departments mentioned above offer elective or mandatory courses tailored specifically to English for design purposes, even though they provide Erasmus internships (e.g., Ankara Haci Bayram University). In a majority of these universities, students are required to take basic English classes in the first and second semesters or English Skills courses in the third and fourth semesters (e.g., Aydin Adnan Menderes University). Some universities offer university elective courses related to Business or Academic English in either the third or fourth semester. Table 11 summarizes design related ESP courses at visual communication design departments at state universities.

Table 11. Design-Related ESP Courses Offered in Visual Communication Design Departments at State Universities

Course & University	Instructor & Suggested Materials	Objectives/Content
GIT 313 Occupational English I *Firat University*	Faculty Member None	The course aims to improve skills in reading, understanding, and writing English materials related to the media field. Students will examine English vocabulary related to several types of communication, including interpersonal communication, mass communication, print media, broadcast media, film, digital media, and photography, through listening and reading materials.
GIT 314 Occupational English II *Firat University*	Faculty Member None	Exercises in reading, writing, listening, and speaking tailored to the specific requirements of students in the professional domain.
ILT 211 Professional Foreign Language 1(Elective) *Kocaeli University*	Faculty Members *Grammer in Use* , Raymond Murphey	In this course, students will read and translate book chapters, articles, and publications relevant to their profession. They will engage in exercises to enhance their English vocabulary and activities to enhance their English listening abilities. They will discuss recent advancements in their profession and work on assignments in this context.
ILT 208 Professional Foreign Language 2 (Elective) *Kocaeli University*	Faculty Members Same with ILT 211	Same with ILT 211
ILT321 English for Business Life (Elective) *Kocaeli University*	Faculty Members None	Students will learn theoretical concepts and practical examples related to effective communication in job applications, including constructing a resume, producing a job application letter, and conducting a job interview. Furthermore, basic challenges in the commercial setting such as composing business correspondence, creating orders, and completing information forms will be analyzed.
GIT 201-2020 Professional English 1 (Compulsory) *Malatya Turgut Ozal*	Faculty Members Lecture notes and presentations	The Professional English II course aims to teach students English terms and words relevant to their field. The goal of this course is to help students improve their reading and comprehension skills, as well as their knowledge of academic and professional terminology. It aims to teach students about the software, professional terms, and phrases used in the visual communication sector.
GIT 202-2020 Professional English II (Compulsory) *Malatya Turgut Ozal*	Faculty Members Same with GIT 201-2020	Same with GIT 201-2020

Note: The data was gathered from university websites, then revised and translated to preserve the original meanings in September 2024.

Similarly, the communication design departments at state universities in Türkiye share some key characteristics. When the curricula of each of these departments are examined, we see that Yildiz Technical University stands out among other state universities with its ESP courses related to the design profession. Table 12 provides a brief summary of the content and focus of these courses.

Table 12. Design-related ESP Courses Offered in Communication and Design Department at Yildiz Technical University

Course & University	Instructor & Suggested Materials	Objectives/Content
ILT3931 English for Design An elective course offered for junior students during the fall term	Faculty Member None	Students will analyze materials on art movements written by art theorists or artists. They will present their projects in English and create portfolios. The course aims to create a setting to improve students' English speaking and critical thinking skills through discussing presentations.
ILT2941 English for Research Spring Term An elective course offered for sophomore students during the spring term	Faculty Member None	Students prepare presentations where they analyze certain art movements or artists. After getting feedback on their presentations, they convert their research into an academic article format.

Note: The data was gathered from Bologna and the official website of the department.

The data presented in Table 11 and 12 enable us to make informed conclusions based on the information provided. It can be concluded that faculty members have the responsibility of teaching ESP courses at these state universities. Upon careful examination, it becomes clear that the course descriptions and contents frequently lack clarity and do not identify specific materials. Furthermore, it is evident that these courses do not incorporate any international ESP resources (see *Table* 3 mentioned earlier in section 2.7.).

Personal Observations

Drawing upon their background as an English instructor and their firsthand observations in an academic setting while studying in the scientific preparatory program for a master's degree in interactive media design during the 2021–2022 academic year at Yildiz Technical University, the researcher has endeavored to elucidate the complexity of design language and its impact on student learning. Furthermore, the researcher has conveyed their analysis based on the

curriculum, design-related ESP courses, and available materials at the Department of Communication and Design at Yildiz Technical University. Table 13 encapsulates several conclusions that have been derived from the analysis of these observations. The analysis and observations provide valuable insights into the researcher's empathetic approach and creative ideation in shaping the design, objectives, and content of the teacher-made comics.

Table 13. Personal Observations Related to English for Design Purposes

Complexity of Design Language	
Factors	**Notes**
Specialized Language	Design has its unique vocabulary and terminology, much like any other field of study. These jargon-ridden terms enhance precise and effective communication among designers, but they may seem challenging to undergraduates with limited understanding of the field.
Multidisciplinary Nature and Borrowed Vocabulary	Design is a multidisciplinary field that includes numerous areas such as interaction design, interface design, user experience design, and others. Each of these fields has its own specialized vocabulary, which contributes to the overall complexity. The multidisciplinary and interdisciplinary nature of design necessitates not only strong English skills but also domain-specific knowledge.
Dynamic Discipline	Design is a dynamic discipline. Advanced principles are subject to change, and technology directly influences design practices, resulting in the frequent integration of other disciplines.
Contextual Connotations	Design terminology may carry varying connotations or interpretations based on the context or particular design field. Novice students may struggle to grasp and apply these specialized terms. Those studying communication design may encounter challenges in utilizing language at a practical level.
Subjectivity in Creativity	Design, as an artistic discipline, is greatly impacted by subjective interpretation. Terms can have different meanings or nuanced connections depending on individual viewpoints or cultural contexts. The inherent subjectivity of design terminology can create challenges in understanding and applying it.
Complexity of Design Language and Its Effects on Students' Experiences	
Factors	**Observations**
Newly Integrated Topics and Limited Available Turkish Materials on the Subject Matter	In some classes, educators utilize English materials like presentations and videos. This poses a challenge for some students, impacting their reading practices and overall attitudes toward reading. Specifically, design students exhibit a reluctance to engage with instructional materials and seldom utilize library resources.
Need of Translation	Certain terms and expressions lack Turkish counterparts, rendering the learning process challenging. Comprehension of these concepts necessitates translation, as a literal interpretation may result in misconceptions.
Mixture of Languages	Instructors frequently use English language materials and sources. Basic and advanced principles and newly integrated topics are usually introduced with primary design sources, which is mainly English. There is a scarcity of Turkish resources in the field of interaction design, specifically in areas such as human-computer interaction and user experience. Additionally, it is evident that Turkish and English are frequently intertwined in student projects.
ESP Courses in the Curriculum and Course Materials	
Selective English for Specific Courses and Materials	There are two elective courses in the curriculum: *ILT3931 English for Design* and *ILT2941 English for Research* are courses that students have the opportunity to enroll in, although they are not typically offered on a regular basis. *ILT2941* has not been made available for the past four years, while *ILT3931* has only been offered once. Following a brief interview with the former *ILT3931 English for Design* instructor, who holds a full-time faculty position at the department, it was revealed that the instructor utilizes websites and blog posts as primary course resources. Additionally, there was no specific list of recommended materials provided. The previous instructor also shared insights from their past teaching experiences, underscoring the diverse language proficiency levels of students and how this impacts the content and engagement strategies employed during the course.

Table 13 highlights the prominent role of English education in communication design and underscores the necessity for localized sources and inclusive materials for design-related ESP content. These materials are also intended to nurture flexible and accessible user experiences while encouraging professional enculturation through constructivist approaches.

Analysis of the Course Participants

A diagnostic level test, learning profile survey, and in-class observations were used to analyze *ILT3931* course participants. The diagnostic level test provided the researcher with fundamental information regarding the students' receptive skills while classroom observations enabled them to assess individual skill levels and make comparisons using diagnostic level test results.

Table 14. Descriptives of the Diagnostic Level Test Scores

Diagnostic Level Test Group Descriptives

	Group	N	Mean	Median	SD	SE
Scores	A	10	36.4	36.0	4.38	1.38
	B	10	35.5	36.5	4.40	1.39

In addition, diagnostic level test results were used to check the homogeneity of the groups. Table 15 presents the findings of the Levene's test, while Table 16 summarizes the implications of the test outcomes.

Table 15. Homogeneity of Variances Test Results of the Diagnostic Level Test

Homogeneity of Variances Tests

		F	df	df2	p
Scores	Levene's	4.05e-32	1	18	1.000
	Variance ratio	0.988	9	9	0.986

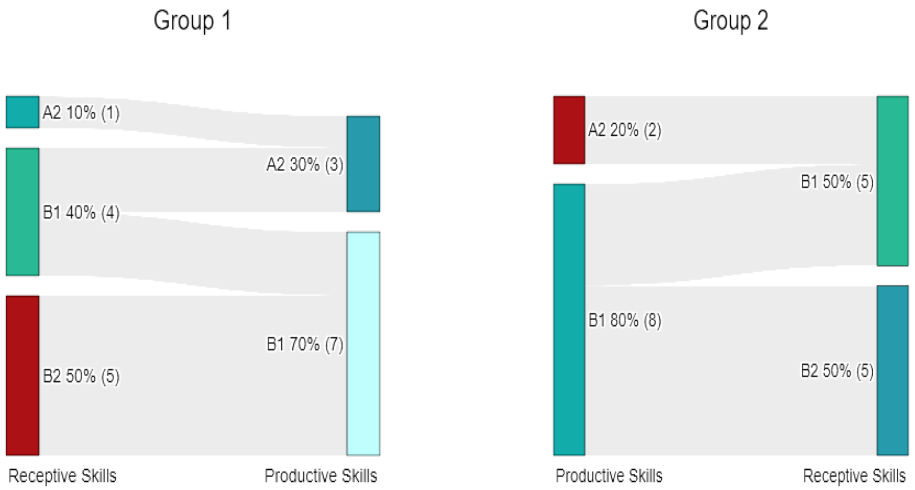
Table 16. An Explanatory Table for the Evaluation of Homogeneity of Variances Test Results

Statistical Test	Levene's Homogeneity of Variances Tests
Test Statistics	4.05×10^{-32}
Degrees of Freedom (df)	1
p-value	1.00
Interpretation	The p-value is greater than the chosen significance level 0.05.

A *p*-value of 1.000 indicates that there is no significant difference in variances between the groups. The Levene test suggested that the requirement of homogeneity has been met within and between groups.

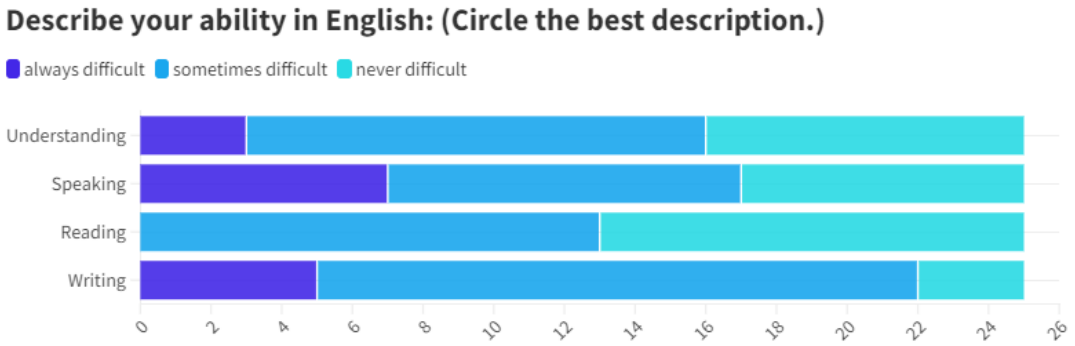
A language level evaluation that is based on the Common European Framework of Reference (CEFR) is also provided for each student during the process of assessing and comparing the findings of diagnostic level test results and in-class diagnostic observations. Despite the fact that homogeneity is statistically met, it would appear that there were some slight differences in the language skills of the students. The Figure 11 illustrates the observed English language skills of the students.

Figure 11. Observed Language Skills of the Students



In the Learning Profile Survey, students were asked to assess their own English proficiency. Notably, their self-assessments provided additional support for the notion that students exhibit better proficiency in understanding English (receptive skills) compared to their ability to actively use the language (productive skills). In Figure 12, we can see a visual representation of how students evaluate their own skills in the English language. This self-assessment allowed students to reflect on their level of proficiency and identify areas where they may need improvement.

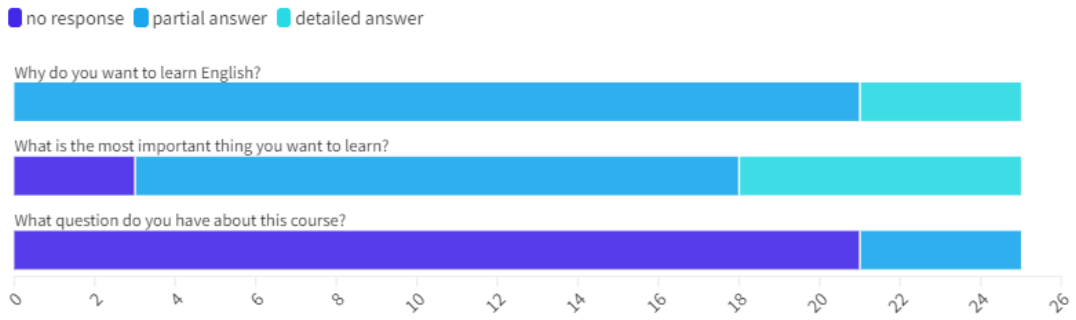
Figure 12. Students' Answers from Learning Profile Survey



Upon thorough analysis of the data, it was concluded that the students exhibited a higher level of proficiency in their receptive as opposed to their productive skills. This suggests that the instructional materials should target a language proficiency level of B2; or possibly even surpass it given the students' ongoing maturation.

The Learning Profile Survey also revealed information about the students' attention and attitudes toward the present course. The students' responses suggested a lack of attention, while in-class observations revealed a lack of motivation. Based on the insights and observations, it was determined that most of the students enrolled in the course because they were unable to find a spot in another elective course occupying the same time period in the lesson calendar. This was also confirmed by the students' answers to the open-ended questions in the survey. The majority of students only provided partial responses when asked about their reasons of studying English and the most essential thing they wanted to learn in the subject matter. Interestingly, only a few students inquired about the present course. Figure 13 illustrates the distribution of responses provided by students in terms of length.

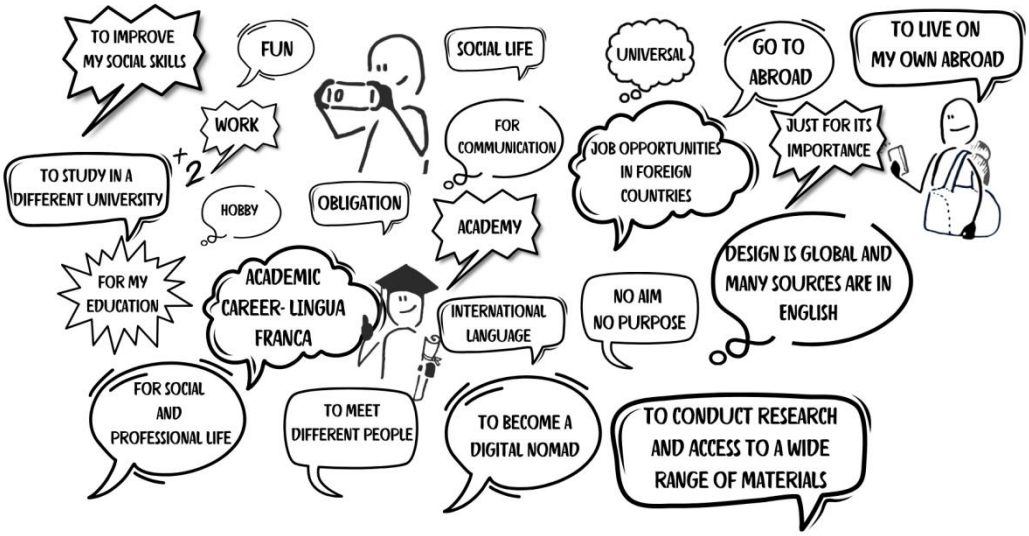
Figure 13. Distribution of Students' Answers for the Open-Ended Learning Profile Survey Questions



It is crucial to highlight that the number of students who completed the learning profile survey in the pre-design phase varied during the quasi-experiment phase of the present study. This is because some students enrolled but later resigned from the course. While the number of students varies, the researcher believes it is critical to include the answers of the withdrawals in the illustration of the learning profile survey findings as they too represent the current student profile.

Comic-style illustrations are found useful to visually represent the partial responses to the open-ended questions in the survey. Subsequently, a thematic analysis was carried out in order to make the data easier to manage and interpret. Figure 14 depicts responses from students regarding their motivations for learning English.

Figure 14. Students' Responses for the Open-Ended Question 1



A thematic analysis was conducted, taking into account the students' responses to the question. From this analysis, it appears that the students are motivated by personal and professional growth, seeking international experiences and opportunities, and may have a particular interest in language and communication. There is also a mix of practical considerations, such as access to resources and career opportunities, along with more abstract motivations like enjoyment and the universality of English.

Figure 15. Students' Responses for the Open-Ended Question 2

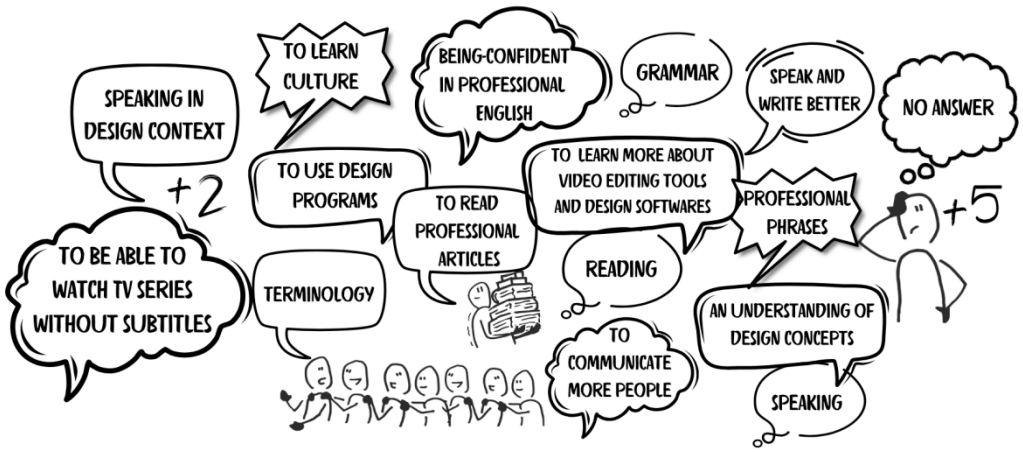


Figure 15 illustrates a wide array of responses given by students when asked about

the most important thing they want to learn. The variety of responses can be categorized into multiple distinct groups based on common themes and ideas. It is interesting to note the range of opinions and perspectives that students hold on this topic; showcasing the depth and complexity of their thoughts on education and personal growth.

The thematic analysis yielded seven distinct categories, derived from the students' responses: (i) language skills improvement; (ii) professional development; (iii) technical skills enhancement; (iv) communication goals; (v) reading and comprehension; (vi) cultural and societal learning, and (vii) uncertain or unspecified goals.

Based on this analysis, it appears that the students primarily focus is improving their language skills, particularly in professional contexts, as well as enhancing their understanding of design concepts and terminology. They also aim to develop technical skills related to video editing and design software. This may indicate the need and importance of English language ability in facilitating learning the relevant programs and the software. Communication goals include being able to speak confidently with foreigners and to communicate effectively with more people. Additionally, there is an interest in reading, cultural learning, and societal understanding. Some goals remain unspecified.

Figure 16. Students' Responses for the Open-Ended Question 3

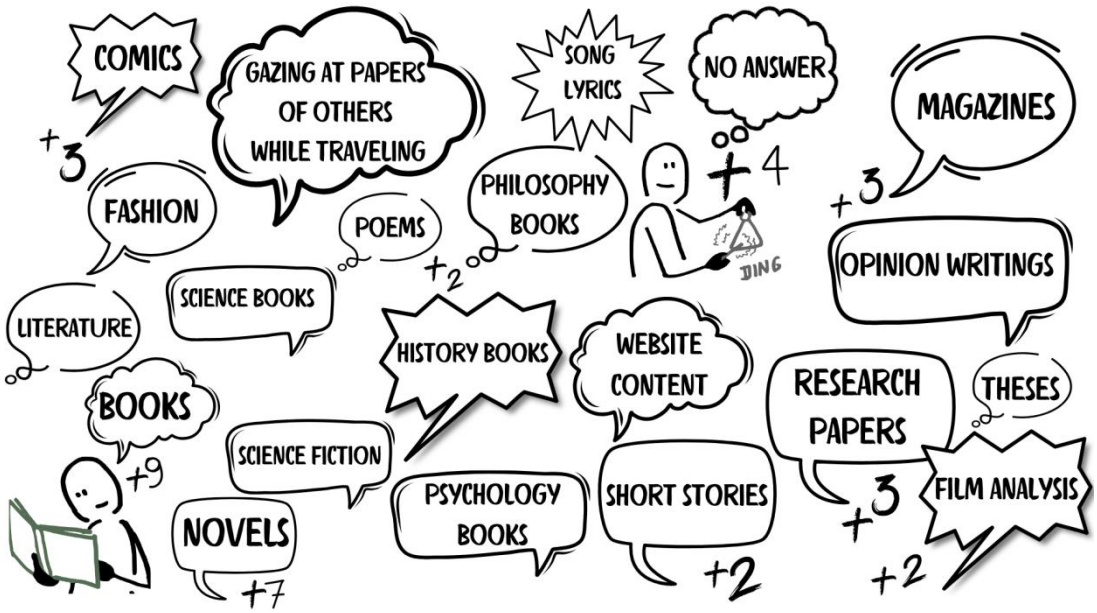


Figure 16 shows that the students' reading interests span across various literary works, academic materials, and genre-specific content such as science fiction and fashion.

When asked if they had any questions about the current course, only five of twenty-five students responded. Their responses indicated a sense of apprehension regarding their performance, encompassing aspects such as successfully completing the course and fulfilling their personal learning goals, which encompassed comprehension of terminology and active participation in class. Table 17 shows the students' responses to the inquiry presented in the learning profile questionnaire.

Table 17. Students' Inquiries About ILT3931 English for Design

Group	Course Completion Status	Response
Group 1	Completed the course	Can I pass?
Group 1	Dropped out the course	Do I fail?
Group 1	Dropped out the course	To learn academic vocabulary
Group 1	Completed the course	Do I have the potential to get what you are going to teach me?
Group 1	Completed the course	None. I just want more interaction in this course.

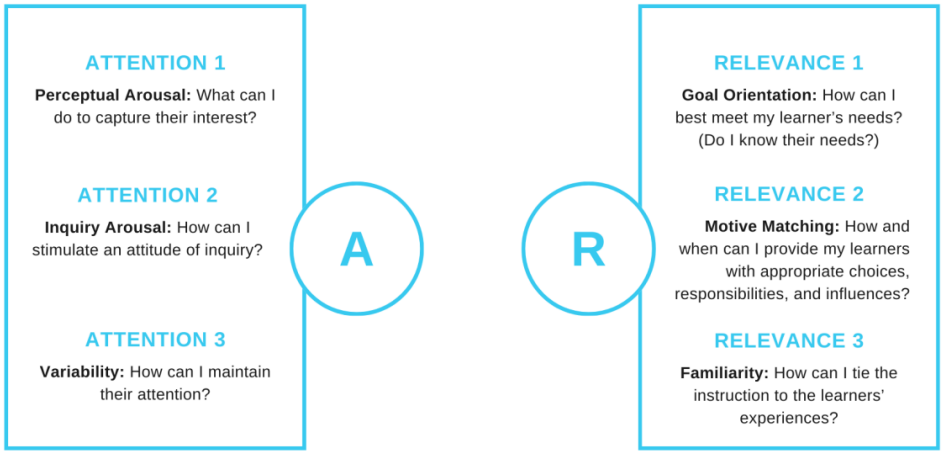
Upon careful examination, the results of the learning profile survey indicate that students recognize the significance of English within their field, possess a desire to acquire knowledge of professional terminology, engage in casual reading, and exhibit reading preferences which include distinct genre combinations. Students' responses, on the other hand, suggested a lack of readiness, and some reluctance. These insights significantly influenced the development of teacher-made comics and prompted the researcher to prioritize motivational aspects of the reading material through "attention" and "relevance" in the ideate and prototype stages. These insights had a significant impact on the researcher's prioritization of the attention and relevance in the design of teacher-made comics.

3.7.2. Ideate and Prototype

After gathering course and audience information, analyzing the audience and existing materials, and then defining objectives, the teacher-designer attempted to list prospective strategies and determine relevant tactics depending on students'

backgrounds to incorporate into the design of educational comics. Keller (2010) suggests, "the audience analysis provides an indication of what types of motivational strategies to use and where to place the greatest emphasis" (p. 62). The define and empathy stages impinged upon the choice of motivational design categories. For the ideate phase of the design thinking process, the teacher-designer prioritized motivation through "attention" and "relevance" using Keller's (2000) definitions, process questions, and ARCS model categories. This required the teacher-designer to reflect on a number of questions, which are shown in Figure 17.

Figure 17. Process Questions for Attention and Relevance



Note: Adapted from "Motivational Design for Learning and Performance: The ARCS Model Approach", Keller,2010, pp. 47-48.

The students' reading habits suggested a tendency to read fiction. Concepts and vocabulary linked to universal design, usability, accessibility, and elements and principles of interaction design were found to be suitable and practical in contextualizing through multimodal storytelling for various reasons. First of all, these topics were deemed to be relevant based on their conceptual relation to subjects previously studied by the course participants. Furthermore, based on the observations of the researcher, it was determined that undergraduate students struggle with these topics in general, and also that design instructors incorporate English materials into their lessons to teach these concepts. The complexity of the students' experiences impacted not only the story's content, but also the outline: a graduate student who

wants to write a comic book to help communication design students struggling with design terminology.

During the initial phase of ideation, the storyline revolved around a design student who wondered why prominent figures such as Donald Norman and Jacob Nielsen have not launched comics projects aimed at improving design students' educational development. Meanwhile, the student was inspired by the artistic endeavors of renowned comics creator Scott McCloud. In the ideate part, available design tools were also explored and identified. While the initial structure of the story was established in the ideate phase, the creative nature of the process led the researcher make adjustments in the storyline and character development during the prototyping phase. The designer-teacher utilized the information acquired during the design thinking process intermittently to inform certain design decisions. In short, the processes of scripting were intricately integrated with the empathy, define, ideate and prototype stages.

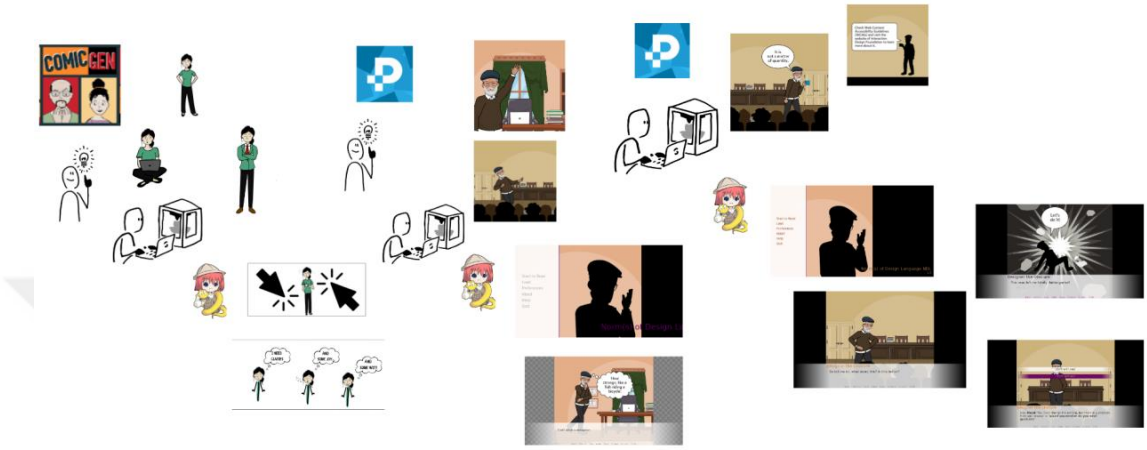
During the prototype phase, the researcher employed three unique design tools: *Comicgen*, *Pixton*, and *Ren'Py*. Table 18 outlines the design tools, detailing their functions, type, and web-page references.

Table 18. Design Tools

Design Tools	Functionality	Type and Source of Information
Comicgen	Characterization	Online Platform & JavaScript API https://gramener.com/comicgen/
Pixton	Characterization Storyboarding	Online Platform https://www.pixton.com/
Ren'Py 8.0.3	Programming of the Interactive Comic	Visual Novel Engine https://www.renpy.org/
Atom	Text Editor	Desktop Application https://atom-editor.cc/

Furthermore, in Figure 18, there is a detailed representation of the prototype phase along with various design tools that are utilized during the creation of teacher-made comics.

Figure 18. Overview of the Design Tools and the Prototype Stage



The rapid prototyping was done using *Comicgen* and *Ren'Py*. The aim of this rapid prototyping was to test the feasibility of the visual novel engine. While *Comicgen* offered fundamental character development and body poses, the researcher found it necessary to manually craft the backgrounds and speech bubbles. Due to the time-consuming nature of coding an additional interactive comic, the researcher opted to utilize a comic generator, which conveniently facilitates the creation of backgrounds and speech bubbles. In the low-fidelity design phase, the researcher used *Pixton* and *Ren'Py*. *Pixton* offered the researcher aid via an expedited narrative-construction process.

The main character in the rapid prototype assumed the role of the story's narrator and turned into a secondary character during the low-fidelity prototyping phase. The main character was replaced by a design professor who deeply admired Donald Norman as a paragon of success and sought to emulate his distinctive style. This fictional academic holds significant prominence in the realm of interaction design, yet grapples with discovering his own distinct voice within the design community. He argues that Donald Norman, Jacob Nielsen, and himself make up the interaction design trio. He identifies himself as the "Design Sensei". This character is known for

their unpredictable and flamboyant nature, often displaying sudden changes in mood and behavior. The same can be said for “Designer the Obscure”, the design student, making it challenging for others to anticipate their next action, thereby injecting an element of unpredictability into their interactions.

The aim was to engage the reader in the interactions between these two characters. Occasionally, Designer the Obscure experiences no difficulty comprehending various concepts, while at other times, they struggle with even the most basic ideas. Nevertheless, to a certain degree, the character poses comparable questions to those posed by students of communication design. This illustrates the relationship and interaction between prototyping and the empathize phase. The teacher-designer believed that identification has the ability to enrich engagement and foster a deeper comprehension of the subject matter (Alterio & McDrury, 2003). Fostering empathy and connection through fictional characters can significantly enrich the educational experience for students (Mar & Oatley, 2008). As the story unfolded, readers could see glimpses of Norman’s principles woven into the fabric of the narrative. It is also a subtle yet powerful tribute to a design icon who has left an indelible mark on the field.

Throughout the high-fidelity prototyping phase, the narrative was elaborated upon and the design was further developed by using *Pixton* and *Ren’Py*. *Pixton* was used for story-boarding while the interactive comic version of the physical comic was programmed using the *Ren’Py* visual novel engine. This was conducted through work on four distinct files *(script*, *gui*, *screens*, and *options*) by means of the *Atom* text editor. The high fidelity design process of each chapter/section lasted six days. A total of eighteen days were devoted to designing the physical comic and its interactive version.

Before implementation, each script was read to check the content and language. Interactive version of the teacher-made comic were distributed and tested in various operating systems prior to each classroom intervention. “Norm(s) of Design Language” was the name given to teacher-made physical comic, while the interactive version was abbreviated as *NDL*.

3.7.3. Test

The teacher-made physical comic and interactive comic were subjected to a quasi-experimental investigation and implemented as intervention materials (see *Section* 3.9. for detailed information).

3.8. An Overview of High-Fidelity Prototypes for Interventions

This section comprises essential general information, visual elements, medium-specific elements and affordances, the language focus, content features, and narratological components of the teacher-made comics. Table 19 offers an intricate analysis of the teacher-made comics, encompassing details such as the title, structural composition, overall page count, and presentation style.

Table 19. General Information for Teacher-Made Comics

Physical Comic Version	Interactive Comic Version
Norm(s) of Design Language	NDL 1.0.
Twelve-panel grid with four tiers of panels	One panel
Serialized chapters	Serialized chapters
23pages (8 p. - 7 p. - 8 p.)	Three parts
Hard copy A4 booklet- Soft copy PDF	Executable file

Table 20 provides a structured overview of key elements from different chapters of the teacher-made, focusing on various narrative and visual components.

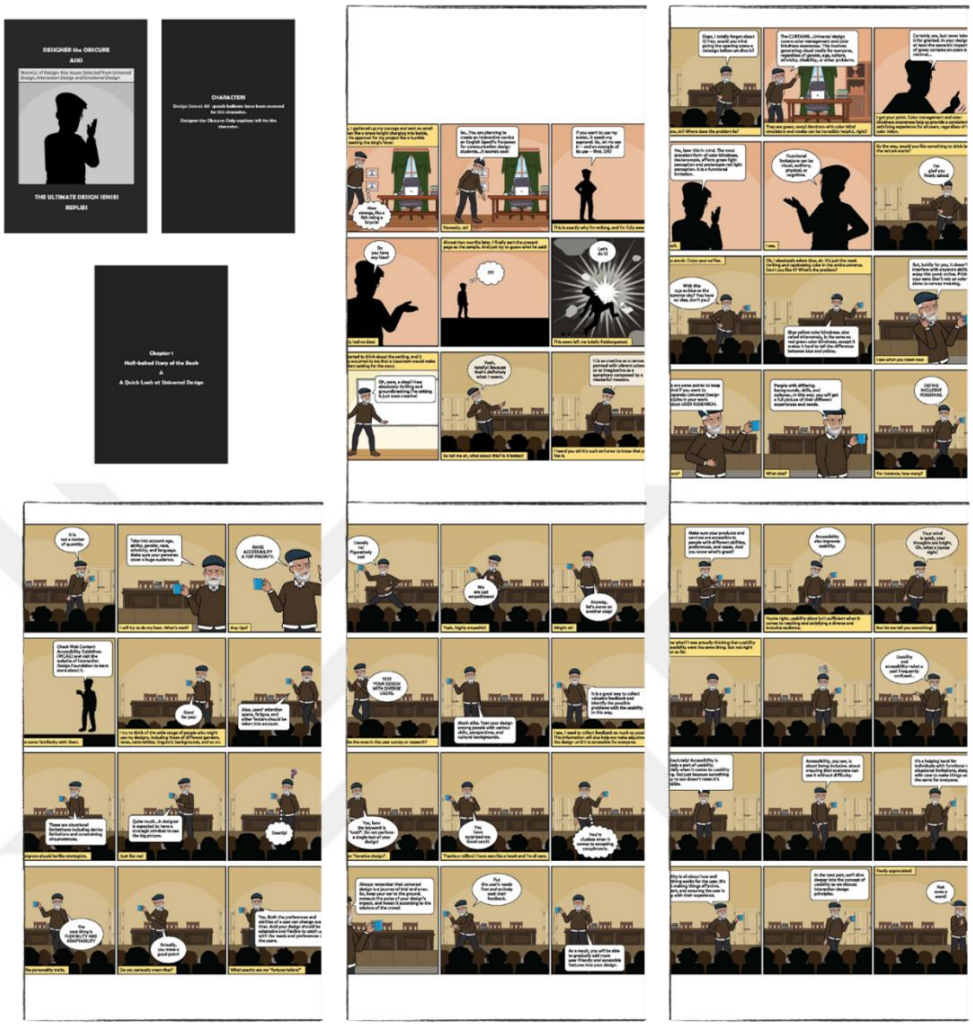
Table 20. Elements of the Story

	Characters	Setting	Structure	Point of View
Chapter 1	The Ultimate Design Sensei & Designer the Obscure	The Ultimate Design Sensei's House & Lecture Hall	Anectodal Introduction & Present Tense Story	Writing: Embedded narrative with multiple point of views; dialogic Seeing: Camera eye
Chapter 2	The Ultimate Design Sensei & Designer the Obscure	Lecture Hall	Present Tense Story & Anectodal Records	Writing: Dialogic Seeing: Camera eye
Chapter 3	Same as in Ch.1 and Ch.2	Lecture Hall & An Imaginative Glassy Environment Somewhere Outside & Basement	Present Tense Story & Anectodal Records	Writing: Dialogic Seeing: Camera eye

The Ultimate Design Sensei	Designer the Obscure
A design professor who admires Donald Norman and copies his style **Physical Comic:** Talks through speech bubbles **Interactive Version:** Talks through static speech bubbles, rarely speaks through dialogue boxes.	A graduate design student who wants to make comics to help non-major English communication design students **Physical Comic:** Narrates story through upper captions, talks through upper and lower captions **Interactive Version:** Only speaks through dialogue boxes.

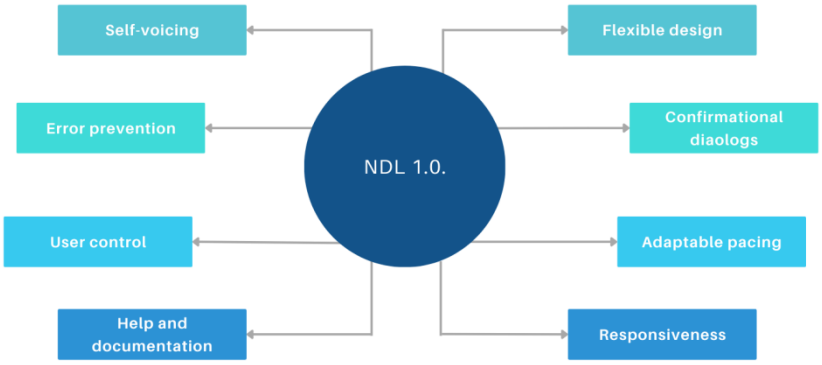
The physical version of the initial chapter contained a title page and a separate page dedicated to introducing the characters (see *Appendix* K for excerpts from the physical comic). The researcher made no changes to the panel layouts of the physical comic and simply used the downloadable version in *Pixton*. The chapters were printed in A4 booklet size on A3 papers. Figure 19 serves as a detailed and thorough visual depiction that brings together each of the separate pages within the initial chapter of the high-fidelity physical comic.

Figure 19. A General Look at the Physical Comic, "Norm(s) of Design Language", Chapter 1



The interactive comic version, *NDL 1.0*, has many features and affordances. The visual novel engine, *Ren'Py*, offers important features in terms of usability and accessibility during the interaction process. These features can be customized and individualized by programmers. Figure 16 illustrates the features of the teacher-made interactive comic, *NDL 1.0*.

Figure 20. Features of the Teacher-made Interactive Comic *NDL 1.0.*

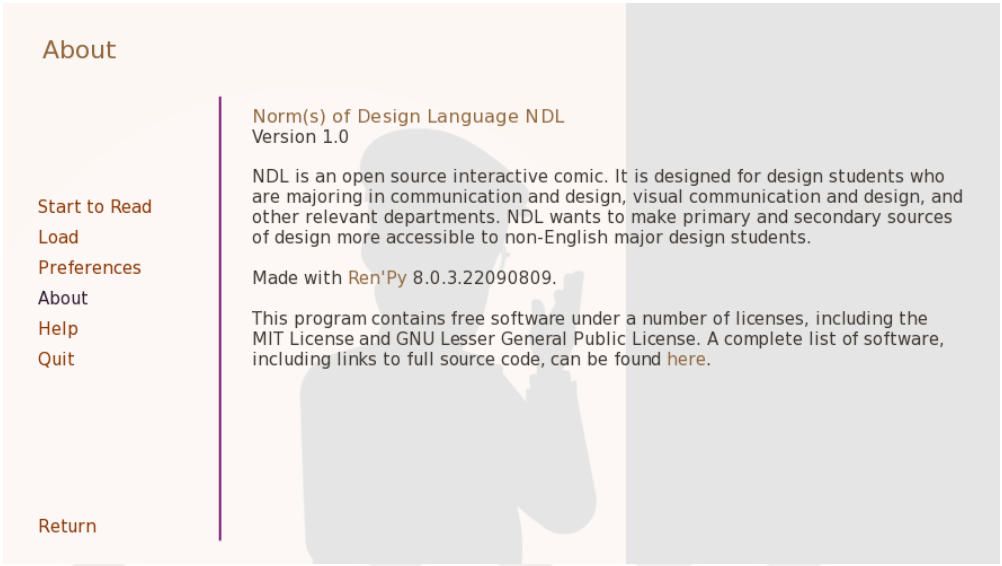


For *NDL 1.0*, the researcher modified confirmation dialogues, menu layout, dialogue boxes, user controls, help and documentation, and menu options. Figure 21 displays the main menu, while Figure 22 provides information regarding the about page.

Figure 21. Main Page of *NDL 1.0*



Figure 22. About Page of *NDL 1.0*



The researcher integrated *Pixton* and *Phyton* statements to facilitate user inputs, interactive menu choices with branching scenarios, hyperlinks, and additional images to enrich the interactive capabilities of the design. Figure 23 and 24 show samples from interactive menu options and user options.

Figure 23. A Sample Scene from *NDL 1.0*

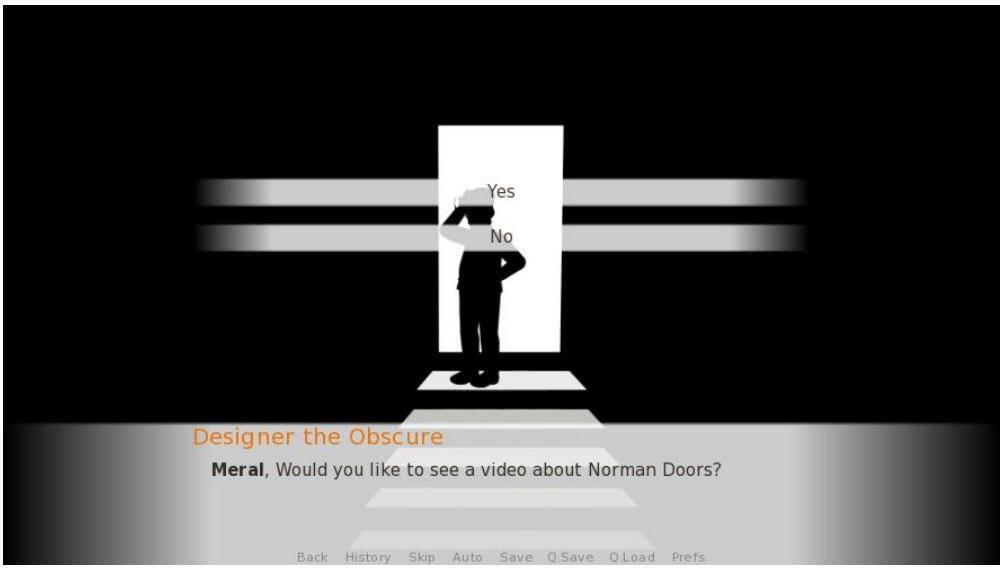


Figure 24. A Sample Scene from *NDL 1.0* - 2



In order to preserve the authentic essence of the comics, the teacher-designer refrained from incorporating any sound effects or embedded videos into the design. Instead, each scene was depicted as a static image contained within a frame, rather than an illustration spanning across the entire width of the page. This approach was chosen to maintain the distinctive and classic comic-like qualities of the panel; staying true to the traditional non-interactive medium's charm and appeal. Still, transitions were utilized to create dynamic animated effects within a sequence in order to avoid monotony. Figures 25—28 display a few sample scenes from the interactive comic. Each image captures a moment in the narrative, showcasing the details put into bringing the story to life.

Figure 25. A Sample Scene from *NDL 1.0* - 3



Figure 26. A Sample Scene from *NDL 1.0* - 4

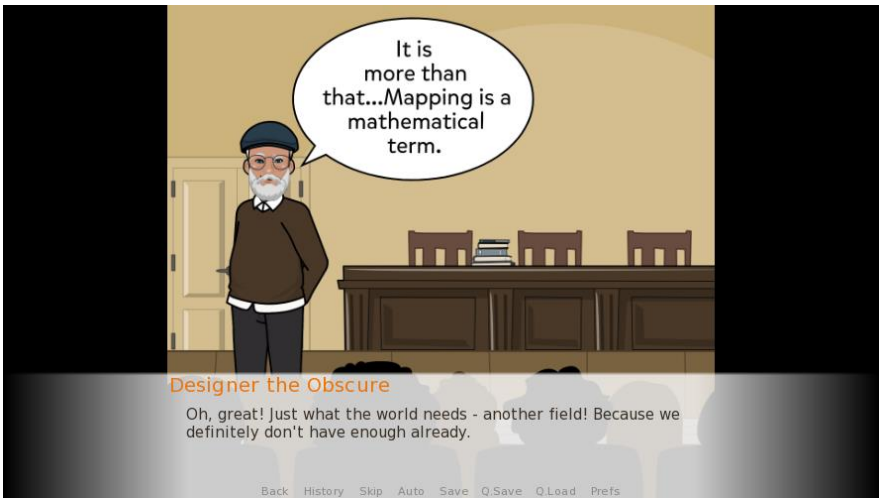


Figure 27. A Sample Scene from *NDL 1.0* - 5

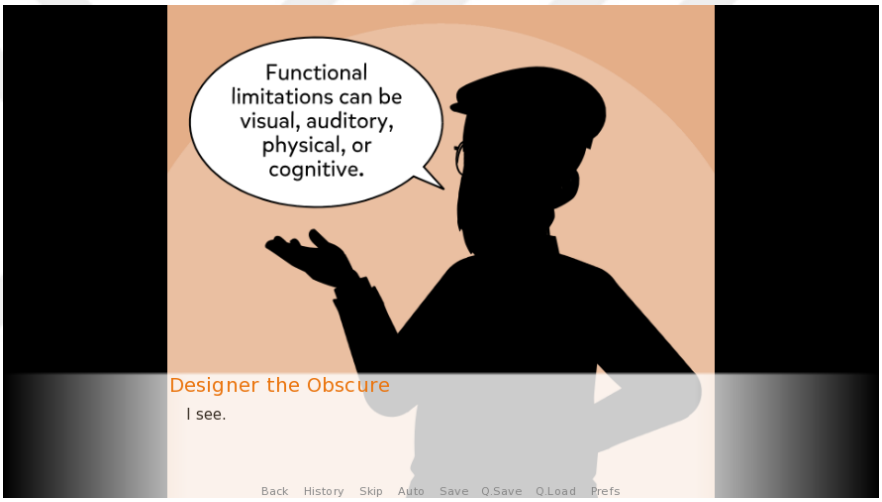


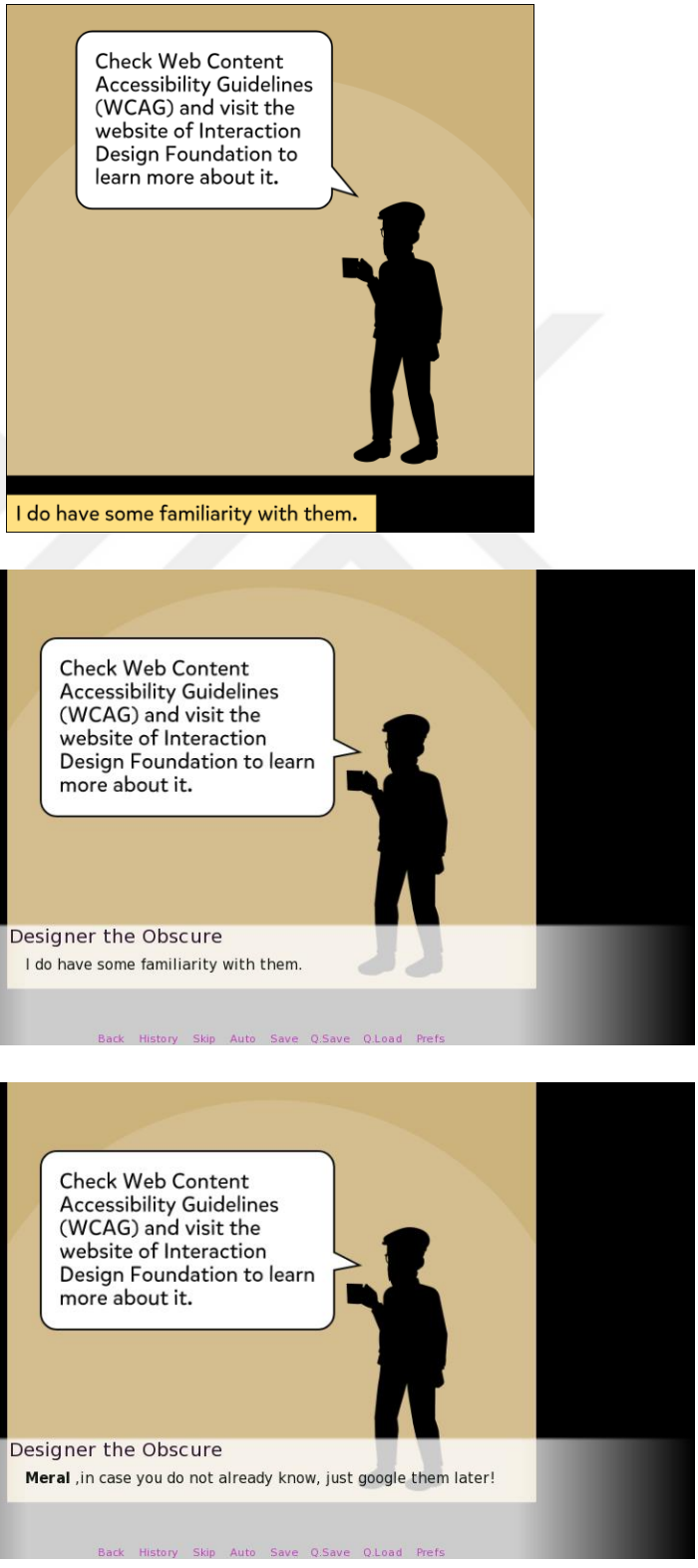
Figure 28. A Sample Scene from *NDL 1.0* - 6



While "Norm(s) of Design" and *NDL 1.0* are considered counterparts, there are distinctions in the way scenes are presented between the two. The interactive version

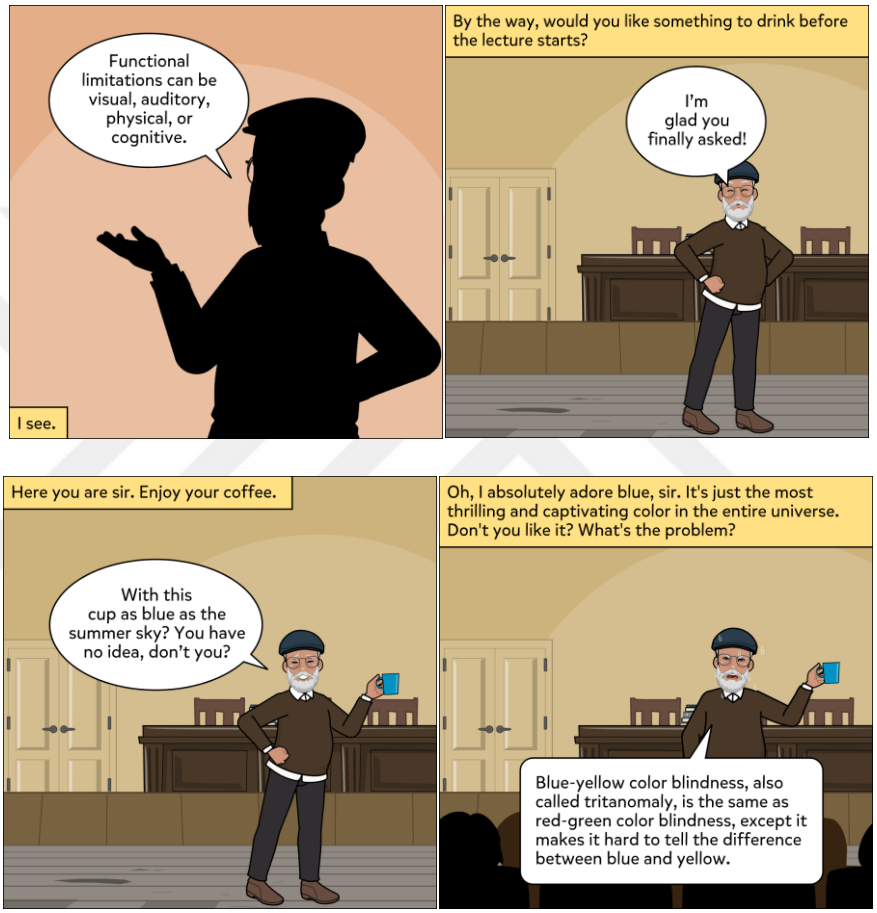
utilizes subtitles and advances through clicking, necessitating the inclusion of additional scenes and interactive stimuli for user engagement. Figures 29 and 30 aim to offer comparative depictions of scenes in the teacher-made physical and interactive comic.

Figure 29. Comparison of Scenes from Chapter 1- 1



The inclusion of comparable scenes from each format facilitates the identification of any potential discrepancies or advantages that one format may possess over the other. This also contributes to the development of a more fair and informative comparison, which provides the audience with a more comprehensive understanding of the formats' relative strengths and weaknesses.

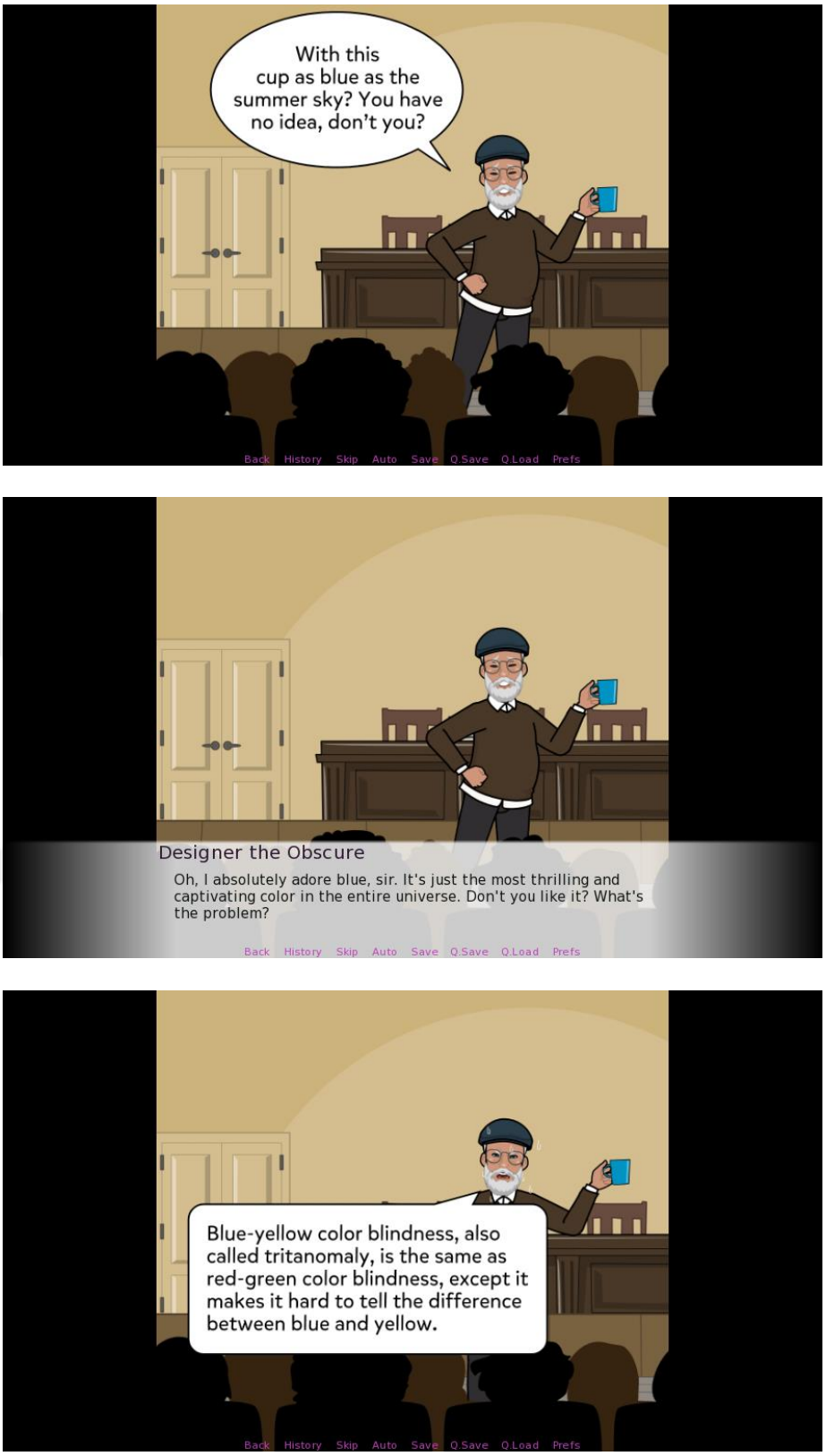
Figure 30. Comparison of Scenes from Chapter 1- 2




Designer the Obscure
By the way, would you like something to drink before the lecture starts?
Back History Skip Auto Save Q.Save Q.Load Prefs


I'm glad you finally asked!
Back History Skip Auto Save Q.Save Q.Load Prefs


Designer the Obscure
Here you are sir. Enjoy your coffee.
Back History Skip Auto Save Q.Save Q.Load Prefs



Tables 21 and 22 contain detailed information regarding the narratological aspects, and content features, respectively. These tables offer a comprehensive breakdown of

the key components that furnish the narrative, including character development, plot structure, and thematic elements.

Additionally, the tables serve as a valuable resource for analyzing the various layers of meaning within the text, allowing for a more nuanced interpretation of the overall narrative. It is widely believed that these tables not only serve as valuable resources for current educational comics but can also serve as a source of inspiration for the development of future educational comic projects.

While Table 21 provides a brief analysis of narratological aspects of the story, Table 22, in particular, stands out for its central emphasis on linguistic components integrated within the comic. This allows readers the opportunity to cultivate a more profound comprehension of the diverse narrative strategies utilized throughout the text.

Table 21. Narratological Aspects of the Teacher-Made Comic

	Norm(s) of Design Language
Tone of the Characters	DS: All-knowing, sarcastic, stingy, facetious, discursive DO: Humorous, poetic, sarcastic, fanciful, clueless, ingratiating
Mood of the Story	Humorous, playful
Style	Forthright, smarmy, sarcastic, ironic Favoring smiles and metaphors
Literary Devices	Allusion, analogy, hyperbole, metaphor, euphemism, irony, colloquialism, motif, flashback, anthropomorphism
Figures of Speech	Simile, personification, assonance
Register	Ceremonial, formal, informal
Verbal Humor and Wordplay	Malapropism, parody, satire, irony, overstatement, absurdity
Visual Humor	Slapstick, deadpan
Comics Elements	Whisper carriers Thought bubbles Speech balloons with root and adjacent awareness Up-fixes
Modality	Visual, linguistic, spatial, and gestural
Semantic mode	Text-dominant

*Note: *DS: Design Sensei *DO: Designer the Obscure*

Table 22 provides an overview of the linguistic components, as well as the professional terms and concepts that are included in the first chapter of the teacher-made comic.

Table 22. Content Features of the Teacher-Made Comic: Chapter 1

	Chapter 1
Title	A Quick Look at Universal Design
Selected Terms and Concepts	universal design, inclusive design, accessibility, usability, iterative design, situational limitations, functional limitations, etc.
Sample Collocations/ Useful Expressions	attention span, to seek feedback, to improve usability, to accept compliments, to perform a test, to collect feedback, to make a good point valuable feedback, to identify problems with something, device limitations, to define inclusive personas, to incorporate design principles, to rely on something, to convey meaning, to affect perception, color management, to generate visual media, to be fully aware of something, vibrant colors, color blindness awareness, etc.
Figurative Speech	to keep your ear to the ground, to measure the pulse of something, to have a strategic mindset, to see the big picture, to get a full picture of something, to dive in something, to take something for granted, to seek approval, to gather up courage, to prick up your ears, etc.

By studying and analyzing the content of these tables, creators, researchers and educators may glean valuable insights and ideas for incorporating educational themes and concepts into their own comic creations. Ultimately, these tables play a crucial role in shaping the future of educational comics by serving as an impetus or catalyst for new ideas and approaches in the field.

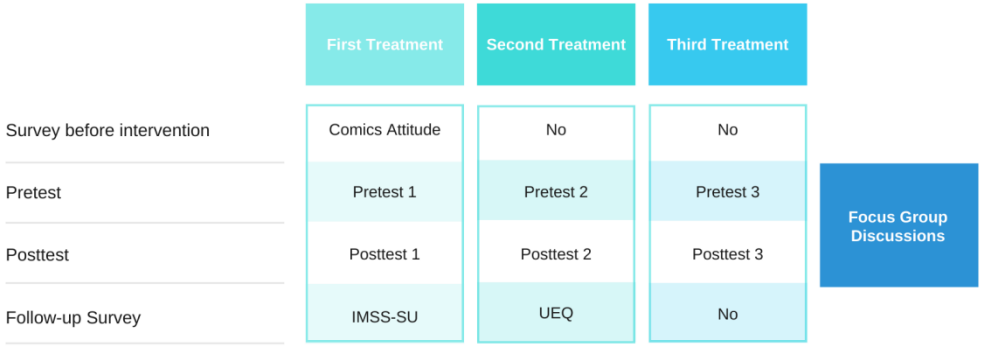
3.9. Procedures of the Quasi-Experimental Study

This section will attempt to illustrate the classroom implementation procedures.

3.9.1. Classroom Interventions

Both teacher-made physical comic and interactive comic were implemented over three sessions of two hours each. For each implementation, the researcher developed a lesson plan, adhering to the research protocol. As a result, the researcher was able to work in a more self-reflective and systematic manner. Both groups were subjected to the same procedures. Figure 31 elucidates the methodologies and instruments employed in the interventions for data collection.

Figure 31. A Brief Outline of the Classroom Interventions



Due to the extremely low enrollment number, participation for interventions was awarded in order to encourage engagement and maintain the current number of the students. This was also meant to encourage improved attention and confidence; thereby allowing for a smooth intervention process. Consequently, the participation rate in the study was comparable between the two groups.

For physical comic interventions, the teacher distributed colorful hard copies to each student (see *Figure* 32 on page 105 & *Figure* 33 on page 106). In interactive comic interventions, students brought their laptops and experienced the program independently (see *Figure* 34 on page 106). Only one student was unable to bring a laptop to the class. Consequently, the teacher provided equipment for the student. For every interactive comic session, the instructor distributed ZIP files through a cloud storage link and saved copies on three separate USB flash drives as a precaution against unstable internet connectivity and potential malware risks.

During interventions, direct instruction was not employed for two reasons. First of all, it was possible that individual traits and approaches would have come into play during the teaching process; these could have jeopardized the research's external validity. Additionally, this could have impacted the dependent variable under evaluation, thereby affecting internal validity.

Figure 32. Figure Showing Envelopes and Hard Copy of Physical Comic Chapter 1



3.9.1.1. First Intervention

In the first intervention, there was a brief discussion on comics. The purpose of this was to initiate a conversation with students in order to gain an understanding of their interest in the medium. The instructor then proceeded to present an in-class online survey concerning the reading of comics for educational purposes. Following the completion of the survey, the instructor presented the survey results to the students and led a discussion regarding the findings.

This was followed by an explanation of the study and the distribution of informed consent forms (see *Appendix* B, mentioned earlier in section 3.3.). The researcher provided necessary information to the students regarding the study and its procedures. The students were informed about the pre-test–post-test evaluation and reassured that it would not impact their participation grades. Each student was given an envelope and asked to create an anonymous code instead of their names. The goal of taking these steps was to keep students from being concerned about the intervention process and feeling upset or unduly responsible for how well or poorly they would perform on the tests.

In each implementation, pre-tests and envelopes were handed together. Following the pre-test, intervention materials were presented. The students were encouraged to read the materials twice. During the second reading, students were invited to define and note in writing any collocations and phrases that they encountered in the comics. The teacher distributed blank collocation lists with keywords and directed students to skim and scan the text. While the students were reading the materials, the teacher reviewed the lists and gave them constructive feedback.

Figure 33. A Picture Showing Physical Comic Group Students Reading



Figure 34. A Picture Showing Interactive Comic Group Students Reading



Figures 33 and 34 show students reading teacher-made comics. To demonstrate each group's engagement with the teacher-made comic, photographs were taken with a focus on the screen or comic being viewed by the student closest to the camera, providing a vantage point that captures the majority of the students from the given angle.

Post-tests were administered following the completion of the reading phase. This was followed by the distribution of the Instructional Material Motivation Survey for Single Use (IMMS-SU). Students delivered their test and survey papers in envelopes. Collocation lists were not compiled. At the end of the intervention, the teacher encouraged students to share their identified collocations. Subsequently, the teacher projected test questions on the board, prompting student responses and providing feedback.

3.9.1.2. Second Intervention

There was no preliminary survey for the second intervention, and the procedures remained the same. Upon completion of the testing process, the User Experience Questionnaire (UEQ) was distributed. Students enclosed their test and survey papers in envelopes, as they did in the previous intervention. The procedures implemented in the preceding session were repeated following the completion of the intervention process.

3.9.1.3. Third Intervention

The third intervention followed the same procedures observed during the second treatment with one exception; there was no follow-up survey. Following the conclusion of the intervention phase, focus group discussions were held two weeks later.

3.10. Final Design and Full Launch

Based on feedback gathered from follow-up surveys and focus group discussions, the researcher decided to make refinements to prepare the high-fidelity prototype of the materials ready for the final design and full launch. A further detailed analysis is given in the "Integration of Data and Discussion of Results" chapter of the thesis. The extracts from the final design of the physical comic and some screenshots from

ongoing design of full launch version of the interactive comic are also provided in the appendices (see *Appendix* L & M). The digital copy of the physical comic is also available under **CC BY-SA 4.0** license (see https://sites.google.com/view/design-sensei/ for further information).

3.11. Summary of the Chapter

This chapter provided an in-depth analysis of the diverse methodological decisions undertaken to tackle the research questions. It commenced with a concise summary of the examination of the research elements, culminated with an exposition of the data collection procedures utilized, analysis, and the research principles. Finally, the chapter concluded with an overview of the preliminary stages of the design and the development process of the teacher-made physical comic, "Norm(s) of Design Language", along with its interactive version, *NDL 1.0*.

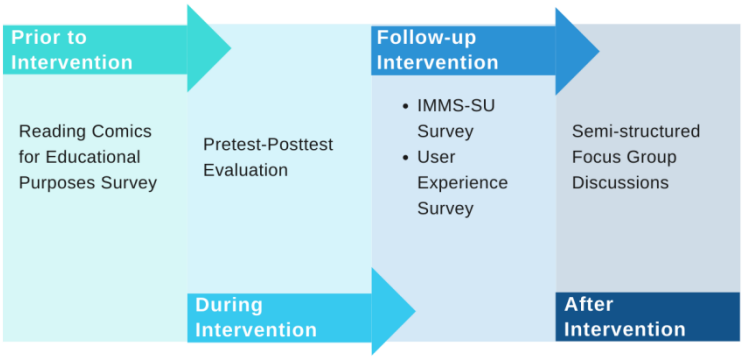
4. RESULTS

4.1. Introduction

This section presents the findings derived from the utilization of a diverse array of data collection tools during the quasi-experimental phase of the research. The outcomes will be delineated into four distinct sections to enhance understanding and examination. Each segment will delve into specific aspects of the collected data, highlighting noteworthy findings and trends that have emerged throughout the study. The analysis of the results and the amalgamation of qualitative and quantitative assessments will be expounded upon in the subsequent chapter.

Figure 35 is presented to depict the data collection tools and instruments employed in the quasi-experimental stage. The data analysis will be sequentially presented in the respective order.

Figure 35. Data Collection Tools and Instruments for the Quasi-Experimental Stage



Prior to delving into the analysis of quantitative data, it is beneficial to establish a foundational framework for the assessment of statistical tests. Table 23 delineates the selected level of significance and additional referential data to be employed in the

statistical test analysis. The inclusion of comparative tables in the study serves to emphasize that no hypotheses were formulated or tested in any of the statistical analyses conducted. Rather, these tables are provided to maintain transparency and clarity regarding the research approach and methodology employed. By explicitly stating the absence of hypotheses, the study's quantitative results are recognized as exploratory in nature, facilitating a more open-ended and unbiased interpretation of the research findings.

This approach underscores the study's commitment to rigor and transparency in research design, allowing readers to understand the investigative process and the nature of the conclusions drawn. By providing this contextual information, the study aims to enhance the credibility and reliability of its findings, ensuring that readers can interpret the results within the appropriate framework of inquiry and analysis.

Table 23. Evaluation of Inferential Tests, with Statistical Significance Assessed at α = 0.05.

Group-Based Pre-Test–Post-Test Evaluation		**Comparative Evaluation of All Assessments**	
μP2= μP1	$p > 0.05$	μC= μIC	$p > 0.05$
There is no difference/effect.		There is no difference.	
If the *p*-value is greater than the chosen significance level 0.05, it indicates no significant effect or difference.			
μP2 ≠ μP1	$p \leq 0.05$	μC ≠ μIC	$p \leq 0.05$
There is a(n) effect/difference.		There is a(n) difference.	
If the *p*-value is less than the chosen significance level 0.05, it indicates **s**tatistically significant difference or effect.			

P1:Pre-test & P2: Post-test

μ= Population mean

The assumptions of normality and homogeneity have a direct influence on the selection of parametric and non-parametric tests for inferential testing. Due to the limited number of participants, the study opted to utilize the Shapiro-Wilk test for

assessing normality (Hanusz & Tarasinska, 2015). The criteria for assessing the results of the Shapiro-Wilk and Levene's tests are given in Table 24.

Table 24. General Framework for the Evaluation of Normality and Homogeneity at a Significance Level of 0.05

$p > 0.05$	$p \leq 0.05$
Shaphiro-Wilk: Data is normally distributed.	**Shaphiro-Wilk:** Data is not normally distributed.
Levene's Test: Variances are equal; the groups are homogeneous.	**Levene's Test:** Variances are not equal; the groups are not homogeneous.

4.2. Reading Comics for Educational Purposes: RCEP Survey

Given that this survey was developed by the researcher, it is important to begin by discussing the reliability analysis. It is imperative to acknowledge that these findings are preliminary and provisional and require additional investigation and analysis.

It is essential to establish a solid foundation of reliability in any research study, and a high Cronbach's α coefficient provides confidence in the accuracy and consistency of the survey instrument (Gliem & Gliem, 2003). This information is crucial in ensuring that the survey results are reliable and valid, allowing for meaningful conclusions to be drawn from the data collected. The table presented by George and Mallery (2003) serves as a guide for interpreting Cronbach's Alpha.

Table 25. Cronbach's Alpha Interpretation Guide by Georger and Mallery (2003)

Cronbach's Alpha	Interpretation
> .9	Excellent
> .8	Good
> .7	Acceptable
> .6	Questionable
> .5	Poor
< .5	Unacceptable

Table 26. Scale Reliability Statistics for RCEP Survey

Scale Reliability Statistics

	Cronbach's α
RCEP scale	0.891

Table 26 shows that the RCEP scale, consisting of 8 items, demonstrated a Cronbach's alpha coefficient of .891, indicating high internal consistency among the items. This implies that the components in the RCEP questionnaire are closely associated with one another, effectively gauging a singular foundational concept or aspect. A Cronbach's alpha score surpassing 0.70 is typically deemed appropriate for scholarly investigations, signifying dependable reliability (George & Mallery, 2003).

For the purposes of this study, the overall internal consistency and reliability of the scale can be deemed adequate (Gliem & Gliem, 2003). Depending on the focus of the research, it is satisfactory to prioritize the reporting of results that align with the research questions and objectives. Thus, reporting the original scale's Cronbach's alpha is sufficient. Nonetheless, further research is required to validate the scale.

The descriptive statistics present the mean, median, standard deviation, minimum, and maximum values for each group (C = Physical Comic and IC = Interactive Comic) across various aspects of attitudes towards comics reading. In general, the mean scores for both groups were generally close, indicating similar perceptions. However, there are some differences observed in specific areas, such as attitudes towards reading comic books to improve English skills and reading digital and interactive digital comics in class (see *Table* 27).

Table 27. Comparative Descriptives of RCEP Survey

Descriptives

	Group	N	Mean	Median	SD	Min.	Max.
How do you feel about reading comics in your spare time?	PC	10	4.20	4.00	1.317	2	6
	IC	10	4.00	4.00	1.826	1	6
How do you feel about the idea of gaining knowledge from comics?	PC	10	4.00	4.00	1.333	2.00	6.00
	IC	10	4.30	4.00	1.418	2.00	6.00
How do you feel about the idea of improving your English by reading comics?	PC	10	5.10	5.50	1.101	3.00	6.00
	IC	10	4.90	5.00	1.101	3.00	6.00
How do you feel about enhancing your professional knowledge through reading comics?	PC	10	3.90	4.50	1.595	1	6
	IC	10	4.30	4.00	1.252	2	6
How do you feel about the idea of reading a comic book as a textbook?	PC	10	4.10	4.50	1.729	2	6
	IC	10	5.00	5.50	1.247	3	6
How do you feel about the idea of reading a digital comic in class?	PC	10	4.30	4.50	1.494	2	6
	IC	10	5.40	6.00	0.966	3	6
How do you feel about the idea of reading an interactive digital comic in class?	PC	10	4.30	5.00	1.636	2	6
	IC	10	5.40	6.00	0.966	3	6
How do you feel about the idea of reading a physical comic in class?	PC	10	4.50	5.00	1.434	2	6
	IC	10	5.30	5.50	0.949	3	6

Note: PC: Physical Comic Group & IC: Interactive Comic Group

Due to the limited sample size and, significantly, the breach of homogeneity, a non-parametric analysis was conducted through an Independent Samples T-Test utilizing the Mann-Whitney U test to compare the attitudes towards utilizing comic books for educational purposes between two distinct experimental groups (see *Table* 29). The aim of this test is to assess whether there are statistically significant differences between groups in a non-parametric setting. Table 28 provides a guide to be used in the evaluation of the results.

Table 28. Comparison of Means between Groups, with Statistical Significance Assessed at α = 0.05.

μC = μIC	**μC ≠ μIC**
$p > 0.05$	$p \leq 0.05$
There is no difference in the distribution of responses between the two groups regarding RCEP items.	There is a difference in the distribution of responses between the two groups regarding RCEP items.

Table 29. Mann-Whitney U-Test Results

Non-parametric Independent Samples T-Test

No	Items		Statistic	p
1	How do you feel about reading comics in your spare time?	Mann-Whitney U	47.5	0.877
2	How do you feel about the idea of gaining knowledge from comics?	Mann-Whitney U	44.5	0.699
3	How do you feel about the idea of improving your English by reading comics?	Mann-Whitney U	43.5	0.631
4	How do you feel about enhancing your professional knowledge through reading comics?	Mann-Whitney U	44.5	0.698
5	How do you feel about the idea of reading a comic book as a textbook?	Mann-Whitney U	34.0	0.223
6	How do you feel about the idea of reading a digital comic in class?	Mann-Whitney U	28.5	0.092
7	How do you feel about the idea of reading an interactive digital comic in class?	Mann-Whitney U	29.5	0.107
8	How do you feel about the idea of reading a physical comic in class?	Mann-Whitney U	33.5	0.200

Statistical significance assessed at $\alpha = 0.05$.

For all the survey questions, the Mann-Whitney U tests indicate that there are no statistically significant differences between the groups' opinions or preferences ($p > 0.05$). Based on the results, there were no significant differences in attitudes towards reading comic books during leisure time (Item 1), acquiring information (Item 2), improving English skills (Item 3), enhancing professional knowledge (Item 4), or reading a comic as a textbook (Item 5 & 8). However, there were slight trends suggesting potential differences in attitudes towards reading digital comics in class (Item 6) and interactive digital comics (Item 7), which may warrant further investigation and provide valuable insights for further analysis and discussion of the results.

For Item 1, the Mann-Whitney U statistic is 47.5, and the associated *p*-value is .877. With a *p*-value of .877, which is greater than the typical significance level of 0.05, there is no statistically significant difference in responses regarding the idea of reading comic books in leisure time. For Item 2, the Mann-Whitney U statistic is 44.5, and the associated *p*-value is .699. With a *p*-value of .699, which is greater than 0.05, there is no statistically significant difference in responses regarding the idea of acquiring knowledge from comic books. For Item 3, the Mann-Whitney U statistic is 43.5, and the associated *p*-value is .631. With a *p*-value of .631, which is greater than 0.05, there is no statistically significant difference in responses regarding the idea of improving English proficiency through comic book reading. For Item 4, the Mann-Whitney U statistic is 44.5, and the associated *p*-value is .698. With a *p*-value of .698, which is greater than 0.05, there is no statistically significant difference in responses regarding the idea of developing professional knowledge through comic book reading. For Item 5, the Mann-Whitney U statistic is 34.0, and the associated *p*-value is .223. With a *p*-value of .223, which is greater than 0.05, there is no statistically significant difference in responses regarding the idea of reading a comic book as a textbook. For Item 6, the Mann-Whitney U statistic is 28.5, and the associated -value is .092. With a *p*-value of .092, which is greater than 0.05, there is no statistically significant difference in responses regarding the idea of reading a digital comic book in class. For Item 7, the Mann-Whitney U statistic is 29.5, and the associated *p*-value is .107. With a *p*-value of .107, which is greater than 0.05, there is no statistically significant difference in responses regarding the idea of reading an interactive digital comic book in class. For Item 8, the Mann-Whitney U statistic is 33.5, and the associated *p*-value is .200. With a *p*-value of .200, which is greater than 0.05, there is no statistically significant difference in responses regarding the idea of reading a printed comic book in class.

Although the results do not show any statistically significant variances, it is noteworthy that there is a subtle inclination indicated by the *p*-values approaching, yet remaining slightly above, the significance threshold of 0.05. While not deemed statistically significant in the current examination, these inclinations could merit additional scrutiny in forthcoming research or supplementary analyses to delve into potential underlying factors or connections.

4.3. Pre-Test–Post-Test Evaluations

The intervention materials were divided into three chapters, each of which was assessed with a pre-test–post-test evaluation. The students were assessed based on a scale of 50 points for each test. Pre-test–post-test 1 comprised of a total of five questions, which included six fill-in-the-blank questions. On the other hand, pre-test–post-test 2 and 3 contained five fill-in-the-blank questions. This structure allowed for a comprehensive evaluation of the participants' understanding and retention of the design terminology and concepts presented in each chapter. By incorporating specific questions targeting key concepts, the assessment aimed to measure the effectiveness of the intervention materials in enhancing the participants' knowledge and application of the target vocabulary. The use of pre-test–post-test design for each chapter ensured a thorough analysis of the impact of the intervention on the participants' learning outcomes. For the purpose of data analysis, each individual experimental group was treated independently, and the comparisons between groups were conducted in a distinct section.

Table 30 provides a framework for conducting statistical analysis, interpreting results, and communicating findings effectively. The following table guides in testing and drawing conclusions about the presence or absence of an effect of the physical comic on the pre-test–post-test results of the students.

Table 30. Comparative Pre-Test–Post-Test Analysis with a Statistical Significance Assessed at $\alpha = 0.05$.

$p > 0.05$	$p \leq 0.05$
There is no difference between the variables *Post-test (P2) 1-2-3* and *Pre-test (P1) 1-2-3*	There is a difference between the variables *Post-test 1-2-3 (P2)* and *Pre-test (P1) 1-2-3*

4.3.1.Pre-Test–Post-Test Results of the Physical Comic Group

By utilizing descriptive statistics, it is possible to summarize data and facilitate the comparison of the pre-test–post-test scores of the students. This facilitates the

evaluation of multiple variables, thereby assisting in the formulation of meaningful conclusions. This thorough analysis enhances a deeper understanding of how teacher-made physical comic effectively achieve its goals. Table 31 offers descriptives of pre-test–post-test results of the physical comic group.

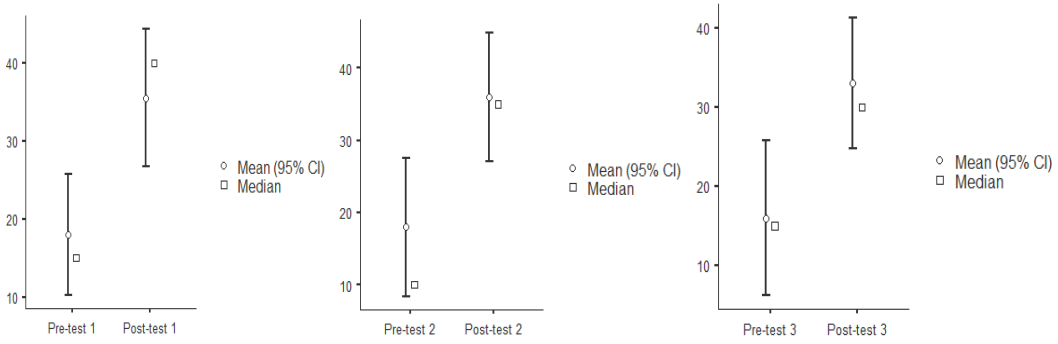
Table 31. Descriptives of Pre-Test–Post-Test Results of the Physical Comic Group

Descriptives

	Pre-test 1	Post-test 1	Pre-test 2	Post-test 2	Pre-test 3	Post-test 3
N	10	10	10	10	10	10
Mean	18.0	35.5	18.0	36.0	16.0	33.0
Median	15.0	40.0	10.0	35.0	15.0	30.0
Standard deviation	12.5	14.2	15.5	14.3	15.8	13.4
Minimum	0	10	0	10	0	20
Maximum	35	50	40	50	40	50
Shapiro-Wilk W	0.891	0.872	0.850	0.868	0.838	0.803
Shapiro-Wilk p	0.175	0.105	0.058	0.094	0.042	0.016

The visual representations provided in Figure 36 delineate the average and middle values for each assessment, providing a thorough analysis of the pre-test–post-test results of the physical comic group. The figure is instrumental in summarizing, examining, and deciphering the pre-test–post-test findings of the participants in the physical comic group; it adeptly communicates the data and provide a succinct summary of the assessments.

Figure 36. Descriptive Plots of the Physical Comic Group



While these descriptive plots depict a notable shift, it will be safe to undertake a more in-depth examination in order to infer conclusions regarding the impact, or lack thereof, of the physical comic on the students' post-test outcomes. Prior to this analysis, the study examines the Shapiro-Wilk test results of the tests in order to assess the assumptions of normality for conducting either a parametric or non-parametric analysis (Hoekstra et al., 2012).

While the data for pre-test 1 and post-test 1, as well as pre-test 3 and post-test 3, appear to be approximately normally distributed based on the Shapiro-Wilk, the data for pre-test 2 and post-test 2 deviates significantly from normality. The Wilcoxon signed-rank test is a non-parametric statistical test that assesses whether the median of a paired difference between two related samples significantly deviates from zero. It is frequently employed as an alternative for the paired t-test in cases where the assumption of normality is violated (Simsek, 2023). Therefore, the study proceeds with its evaluation by utilizing a non-parametric alternative of the paired t-test.

Table 32. Non-parametric Alternative of Paired Samples T-Test Results for the Physical Comic Group

Paired Samples T-Test

			Statistic	p	Mean difference	SE difference
Post-test 1	Pre-test 1	Wilcoxon W	55.0	0.006	17.5	2.61
Post-test 2	Pre-test 2	Wilcoxon W	55.0	0.005	15.0	2.91
Post-test 3	Pre-test 3	Wilcoxon W	45.0 [a]	0.008	20.0	3.35

Statistical significance assessed at $\alpha = 0.05$.

Students were evaluated out of 50 points.

[a] 1 pair(s) of values were tied

The Wilcoxon W statistic yielded a significant result ($W = 55.0$, $p = .006$), indicating a notable difference between post-test 1 and pre-test 1 scores. The mean difference between post-test 1 and pre-test 1 scores was found to be 17.5 points. Similarly, the Wilcoxon W statistic showed a significant difference between post-test 2 and pre-test 2 scores ($W = 55.0$, $p = .005$). The mean difference between post-test 2 and pre-test 2 scores was 15.0 points. In the last comparison, the Wilcoxon W statistic also indicated a significant difference ($W = 45.0$, $p = .008$) between post-test 3 and pre-test 3 scores. The mean difference between post-test 3 and pre-test 3 scores was 20.0 points.

Overall, the study's results indicate significant and noteworthy improvements in the measured variables across all three scenarios from the initial evaluation to the final assessment.The results from the Wilcoxon signed-rank test indicate significant improvements in scores from pre-test to post-test for all three tests. The *p*-values (.006, .005, and .008) are all below the conventional significance level of 0.05, confirming that the observed differences are statistically significant. The mean differences show that post-test scores are higher than pre-test scores in each comparison, reflecting the effectiveness of the physical comic intervention applied between the pre-tests and post-tests.

4.3.2.Pre-Test–Post-Test Results of the Interactive Comic Group

Descriptive statistics for the interactive comic group provide a comprehensive overview of the data collected from pre-test–post-test scores (see *Table* 33). These statistics are essential for comparing the performance of the group before and after the intervention, identifying key variables that may have influenced the outcomes, and ultimately drawing meaningful conclusions from the study. This detailed analysis allows for a deeper understanding of the effectiveness of the interactive comic in achieving its intended goals and can inform future research and interventions in this field.

Table 33. Descriptives of Pre-Test–Post-Test Results of the Interactive Comic Group

Descriptives

	Pre-test 1	Post-test 1	Pre-test 2	Post-test 2	Pre-test 3	Post-test 3
N	10	10	10	10	10	10
Mean	20.0	35.5	24.0	35.0	16.0	37.0
Median	22.5	40.0	30.0	30.0	10.0	35.0
Standard deviation	14.3	6.85	8.43	11.8	13.5	8.23
Minimum	0	20	10	20	0	30
Maximum	40	40	30	50	40	50
Shapiro-Wilk W	0.927	0.727	0.717	0.850	0.896	0.781
Shapiro-Wilk p	0.416	0.002	0.001	0.058	0.198	0.008

Figure 37 is given to facilitate the extraction of knowledge and enable well-informed decision-making by visually representing the dispersion of median and mean values from the pre-test and post-test evaluations.

Figure 37. Descriptives Plots of the Interactive Comic Group

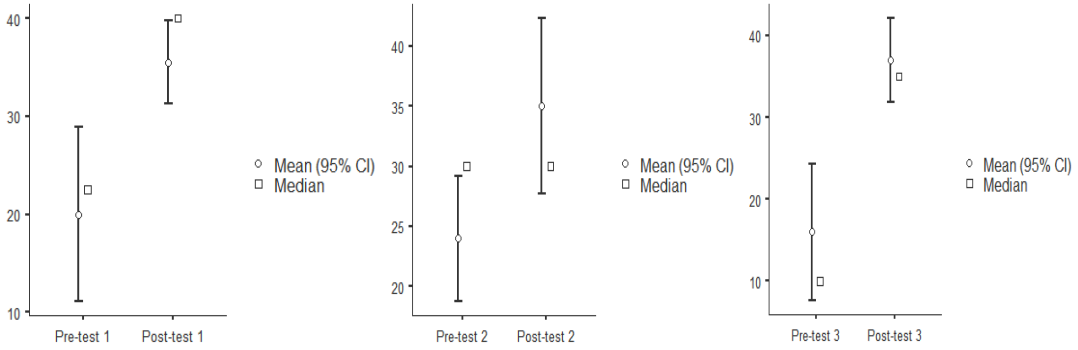


Figure 37 reveals that teacher-made interactive comic interventions implemented between the pre-tests and post-tests were effective in enhancing participants' performance.

Shapiro-Wilk *p*-values suggest that several of the score distributions deviate from normality, particularly the post-test scores for tests 1 and 3 and pre-test scores for test 2. Therefore, the research advances with its assessment by employing a non-parametric alternative for the paired t-test. Table 30 summarizes the statistical results comparing pre-test and post-test scores for three different tests using the Wilcoxon signed-rank test.

Table 34. Non-parametric Alternative of Paired Samples T-Test Results of the Interactive Comic Group

Paired Samples T-Test

			Statistic	p	Mean difference	SE difference
Post-test 1	Pre-test 1	Wilcoxon W	45.0 [a]	0.008	17.5	3.53
Post-test 2	Pre-test 2	Wilcoxon W	36.0 [b]	0.012	15.0	2.33
Post-test 3	Pre-test 3	Wilcoxon W	55.0	0.005	20.0	3.14

Statistical significance assessed at $\alpha = 0.05$.

Students were evaluated out of 50 points.

[a] 1 pair(s) of values were tied

[b] 2 pair(s) of values were tied

The results revealed statistically significant differences for all assessments. For post-test 1 compared to pre-test 1, the Wilcoxon signed-rank test statistic was 45.0, indicating a significant difference (p = .008). The mean difference of 17.5 suggests that, on average, there was an increase of 17.5 points in scores from the pre-test to the post-test for Assessment 1. However, it is important to consider that this difference has a relatively large standard error (3.53), indicating some variability in the data. Similarly, for post-test 2 compared to pre-test 2, the Wilcoxon signed-rank test statistic was 36.0, showing a significant difference (p = .012). The mean difference of 15.0 suggests that there was an increase of 15.0 points in scores from the pre-test 2 to the post-test 2. This difference has a smaller standard error (2.33) compared to the first pre-test–post-test assessment, indicating relatively less variability in the data. Lastly, for post-test 3 compared to pre-test 3, the Wilcoxon signed-rank test statistic was 55.0, indicating a significant difference (p = .005). The mean difference of 20.0 suggests that, on average, there was an increase of 20.0 points in scores from the pre-test to the post-test for the third assessment. Similar to the first pre-test–post-test assessment, this difference has a relatively large standard error (3.14), indicating some variability in the data. These findings suggest that there were significant changes in scores from pre-test to post-test across all three assessments. The consistently significant results across all tests underscore the robustness of the improvements resulting from interactive comic interventions.

4.3.3.Comparing Pre-Test–Post-Test Results of the Groups

Table 35 provides an analysis of the comparative descriptives and Shaphiro-Wilk test results for normality. It indicates that for the physical comic group, all p-values are greater than 0.05, except for the last one (.016), which is less than 0.05. This suggests that for most cases in the physical comic group, the data are normally distributed, except for the last case where there may be evidence of deviation from normality. For the interactive comic group, most of the p-values are less than 0.05, indicating that the data in these cases significantly deviate from normality. When the assumption is violated, it may be necessary to employ alternative tests or make adjustments to the analysis (Corder et al., 2014). Thus, the study conducted non-parametric Kruskal Wallis test, which is given as the non-parametric alternative of one-way ANOVA in *Jamovi* (see *Table* 36).

Table 35. Comparative Descriptives of the Groups

Descriptives

	Group	Pre-test 1	Post-test 1	Pre-test 2	Post-test 2	Pre-test 3	Post-test 3
N	PC	10	10	10	10	10	10
	IC	10	10	10	10	10	10
Mean	PC	18.0	35.5	18.0	36.0	16.0	33.0
	IC	20.0	35.5	24.0	35.0	16.0	37.0
Median	PC	15.0	40.0	10.0	35.0	15.0	30.0
	IC	22.5	40.0	30.0	30.0	10.0	35.0
Standard deviation	PC	12.5	14.2	15.5	14.3	15.8	13.4
	IC	14.3	6.85	8.43	11.8	13.5	8.23
Minimum	PC	0	10	0	10	0	20
	IC	0	20	10	20	0	30
Maximum	PC	35	50	40	50	40	50
	IC	40	40	30	50	40	50
Shapiro-Wilk W	PC	0.891	0.872	0.850	0.868	0.838	0.803
	IC	0.927	0.727	0.717	0.850	0.896	0.781
Shapiro-Wilk p	PC	0.175	0.105	0.058	0.094	0.042	0.016
	IC	0.416	0.002	0.001	0.058	0.198	0.008

Table 36 shows the test statistics (χ^2), degrees of freedom (*df*), p-values, and effect sizes (ε^2) for each factor level (pre-test and post-test) across three different time points. These results indicate that for all pre-tests and post-tests (1, 2, and 3), the *p*-

values are greater than 0.05, suggesting no statistically significant differences between the medians of the groups.

Table 36. Kruskal-Wallis Test Results of Pretest-Posttest Assessments

Kruskal-Wallis

	χ^2	df	p	ε^2
Pre-test 1	0.0947	1	0.758	0.00498
Post-test 1	0.1916	1	0.662	0.01008
Pre-test 2	0.9060	1	0.341	0.04768
Post-test 2	0.0768	1	0.782	0.00404
Pre-test 3	0.0243	1	0.876	0.00128
Post-test 3	0.8145	1	0.367	0.04287

Note: Statistical significance assessed at $\alpha = 0.05$.

Furthermore, to address the issue of non-homogeneous group variances, the researcher also used Welch's t-test, a robust parametric alternative to Kruskal Wallis statistical test. When sample sizes are unequal or the assumptions of normality are not met, this t-test can be also utilized to account for degrees of freedom in independent two-group t-tests (Derrick et al. , 2016). At the 0.05 level of significance, Welch's t-test also revealed no statistically significant difference between the means of the two experimental groups.

It is also important to note that pairwise comparisons can help inform post-hoc analyses or further investigations into the explanations of observed differences (Demšar, 2006). For example, if one treatment group performed significantly better than the other, the study would investigate the factors that contribute to this difference. The study did not conduct a post-hoc analysis because there was insufficient evidence to support the conclusion that the mean ranks of the two groups differ significantly in pre-test–post-test evaluation.

Based on the aforementioned analyses, it can be deduced that both teacher-made physical comic and interactive comic produced equally positive results in improving students' professional language, demonstrating effectiveness in enhancing the understanding of design terminology and concepts. Upon evaluating their impact, no significant difference was detected between the intervention materials with regard to the test scores. However, conducting further research with a larger sample size has the potential to produce alternative results. Further exploration with a larger sample size holds the promise of unveiling novel insights and perspectives on the comparison of physical and interactive comics. Ultimately, increasing the sample size can also enhance the reliability and validity of the research findings.

4.4. Follow-up Intervention

In this section, the study scrutinizes the examination of the follow-up surveys.

4.4.1. Instructional Material Motivation Survey - for Single Use (IMMS-SU) Results

This section intends to disclose the results of the IMMS-SU instrument that was conducted subsequent to the initial implementation of the teacher-made comic interventions.

4.4.1.1. IMMS-SU Results of the Physical Comic Group

The teacher-made physical comic achieved a total score of 624 out of 700 on the IMMS-SU assessment. Achieving a score of 624 out of 700 points in the motivational aspects of a material is highly encouraging. It signifies a significant degree of motivation and favorable reaction to the material. The high score indicates that the participants of the physical comic group found the material to be highly engaging, interesting, and motivating, which likely encouraged them to further interact with the material.

Table 37 provides descriptive statistics for the physical comic group survey results.

Table 37. Descriptives of IMMS-SU for the Physical Comic Group

Descriptives

							Shapiro-Wilk	
		Mean	Median	SD	Minimum	Maximum	W	p
1	I studied with this material easier than I expected.	3.90	4.00	0.876	2	5	0.820	0.026
2	I remember more easily what I have studied with this material.	4.20	4.00	0.632	3	5	0.794	0.012
3	There were features in this material that made me realize the crucial information.	4.20	4.00	0.632	3	5	0.794	0.012
4	I enjoyed studying with this material.	4.10	4.00	0.568	3	5	0.752	0.004
5	This material was intriguing.	4.00	4.00	0.943	3	5	0.769	0.006
6	This material allowed me to focus on the topic.	4.30	4.00	0.483	4	5	0.594	< .001
7	I believed that studying with this material would be beneficial.	4.20	4.00	0.632	3	5	0.794	0.012
8	This material has increased my belief that I can be successful.	3.80	4.00	0.632	3	5	0.794	0.012
9	I prefer to study with such materials on complex topics.	4.40	4.50	0.699	3	5	0.781	0.008
10	This material contained interesting properties.	4.50	5.00	0.707	3	5	0.731	0.002
11	This material increased my desire to study.	4.40	4.50	0.699	3	5	0.781	0.008
12	I watched/experienced/read this material with pleasure to the end.	3.40	3.00	0.843	2	5	0.890	0.172
13	I spent less effort studying with this material.	3.70	4.00	0.675	3	5	0.802	0.015
14	It was exciting for me to study with this material.	4.10	4.00	0.738	3	5	0.833	0.036

In order to understand the motivational aspects of the physical comic, the study examined each component by analyzing their mean, median, standard deviation, as

well as minimum and maximum values. For Item 1, the mean score of 3.90 suggests that, on average, participants found studying with the material slightly easier than they initially expected. The median score of 4.00 indicates that the middle value of the responses falls at 4, suggesting that a majority of participants reported finding studying easier than expected. The standard deviation of 0.876 indicates the extent of variability in participants' responses around the mean. With a relatively moderate standard deviation, it suggests that there is some variability in participants' perceptions, but responses are clustered relatively close to the mean. The range from 2 to 5 indicates the spread of responses, with the lowest reported difficulty being 2 and the highest being 5. This suggests that while some participants found studying with the material significantly easier than expected, others found it somewhat more challenging with a score of 2.

For item 2, students rated their agreement with the statement "I remember more easily what I have studied with this material" quite high, with an average rating of 4.20 on a scale from 1 to 5. The responses showed relatively low variability, indicated by a standard deviation of 0.632, suggesting that students' opinions were generally consistent. The minimum rating was 3, while the maximum was 5, reflecting a range of agreement levels among physical comic group participants.

The evaluation of Item 3 indicates that participants generally acknowledged features in the material that helped them recognize crucial information. This can be also supported by the high mean and median scores of 4.20 and 4.00, respectively, suggesting a favorable perception among students. Additionally, the relatively low standard deviation of 0.632 implies minimal variability in responses, indicating a consensus among participants regarding the effectiveness of these features.

For Item 4, the average score of 3.40 suggests that participants generally derived a moderate level of enjoyment from engaging with or reading the material through to completion . The median score of 3.00 suggests that the distribution may be slightly skewed towards lower enjoyment levels. The relatively high standard deviation of 0.843 suggests variability in participants' responses, indicating that some found the material very enjoyable while others did not. Item 5, "This material was intriguing", had a mean score of 4.00 and a median score of 4.00, indicating that participants generally found the material intriguing. The consistency between the mean and

median suggests a relatively symmetrical distribution of responses. However, the relatively high standard deviation of 0.943 suggests considerable variability in participants' perceptions, indicating that while many found the material intriguing, others may have had differing opinions or experiences. Furthermore, the Shapiro-Wilk test yielded a p-value of .006, indicating a departure from normality in the distribution of responses. While this does not invalidate the results, it suggests the need for caution when interpreting them.

Item 6, "This material allowed me to focus on the topic", received a high mean score of 4.30 and a median score of 4.00, indicating that participants generally felt the material facilitated their focus on the topic. The high mean suggests a strong agreement among respondents regarding the material's effectiveness in promoting focus. Additionally, the relatively low standard deviation of 0.483 suggests minimal variability in responses, indicating a consensus among participants.

For Item 7, "I believed that studying with this material would be beneficial", participants reported a mean score of 4.20 and a median score of 4.00. These values suggest that, on average, participants believed that studying with the material would be beneficial. The consistency between the mean and median indicates a relatively symmetrical distribution of responses around the central value. However, the standard deviation of 0.632 suggests some variability in participants' beliefs about the material's potential benefits. While the majority of participants expressed positive views, some variability exists, indicating that not all participants held the same level of confidence in the material's benefits.

For Item 8, "This material has increased my belief that I can be successful", physical comic group participants reported a mean score of 3.80 and a median score of 4.00. These values suggest that, on average, participants perceived a slight increase in their belief in their potential for success after engaging with the material. The median being higher than the mean indicates that the distribution might be slightly skewed towards higher scores, though not significantly (Jupp, 2006). The standard deviation of 0.632 indicates some variability in participants' responses, suggesting that while many experienced an increase in belief, others may have had differing experiences or perceptions.

For Item 9, “I prefer to study with such materials on complex topics”, participants reported a high mean score of 4.40 and a median score of 4.50. On average, these values indicate that participants strongly preferred studying with materials similar to the one provided, especially when dealing with complex topics. The consistency between the mean and median suggests a relatively symmetrical distribution of responses around the central value. The standard deviation of 0.699 suggests some variability in participants’ preferences, indicating that while many strongly preferred such materials, others may have had differing opinions.

For Item 10, “This material contained interesting properties”, participants reported a high mean score of 4.50 and a median score of 5.00. These values suggest that, on average, participants found the material to possess interesting properties. The higher median compared to the mean indicates that the majority of responses were clustered towards the upper end of the scale, indicating strong agreement among participants regarding the material's interesting properties. The standard deviation of 0.707 suggests some variability in participants’ perceptions, indicating that while many found the material interesting, others may have had differing opinions.

For Item 11, “This material increased my desire to study”, participants reported a mean score of 4.40 and a median score of 4.50. These values indicate that, on average, participants perceived an increase in their desire to study after engaging with the material. The relatively high mean and median scores suggest strong agreement among respondents regarding the physical comic’s ability to enhance their motivation to study. The standard deviation of 0.699 suggests some variability in participants’ responses, indicating that while many physical comic group participants experienced an increase in desire to study, others may have had differing experiences or perceptions.

For Item 12, “I watched/experienced/read this material with pleasure to the end”, participants reported a mean score of 3.40 and a median score of 3.00. These values suggest that participants experienced some level of pleasure while engaging with the material. However, the mean being lower than the median indicates that the distribution might be slightly skewed towards lower scores, though not significantly. While participants generally experienced some pleasure while engaging with the material, there was considerable variability in their responses. This finding highlights

the subjective nature of individual experiences with educational material and the importance of considering diverse perspectives when evaluating instructional effectiveness.

For Item 13, “I spent less effort studying with this material”, the physical comic group participants reported a mean score of 3.70 and a median score of 4.00. These values suggest that participants perceived that they spent less effort studying with the material. The median being higher than the mean indicates that the distribution might be slightly skewed towards higher scores, albeit not significantly. The standard deviation of 0.675 indicates the extent of variability in participants’ responses around the mean. With a relatively low standard deviation, it suggests that the responses are clustered relatively close to the mean, indicating some consistency in participants’ perceptions of reduced effort. In general, the data suggests that participants commonly perceived a decrease in effort when studying with the material, although there were some variations in their responses.

For Item 14, “It was exciting for me to study with this material”, participants reported a mean score of 4.10 and a median score of 4.00. These values suggest that, on average, participants found studying with the material to be exciting. The consistency between the mean and median indicates a relatively symmetrical distribution of responses around the central value.

In conclusion, physical comic group participants exhibited a predominantly favorable perception of the material, discerning it as engaging, beneficial, and intellectually stimulating. Nevertheless, noticeable variability in responses underscored the subjective nature inherent in individual encounters with teacher-made physical comic. Despite an overarching trend toward positive evaluation, instances of divergent perspectives were evident, emphasizing the necessity for a nuanced apprehension of participants’ experiences within the teacher-made physical comic.

4.4.1.2. IMMS-SU Results of the Interactive Comic Group

The total score of the interactive comic group for IMMS-SU is 628 points out of 700. The students’ responses indicate a high degree of motivation and a favorable reaction to the interactive comic. The high score suggests that the interactive comic effectively captivates the students’ attention, connects with their interests or needs,

and possibly cultivates a sense of motivation and enthusiasm for learning. Table 38 on page 133 provides a comprehensive overview of the attributes and additional analysis of the students' responses.

For Items 1 & Item 2, "I studied with this material easier than I expected" and "I remember more easily what I have studied with this material", interactive comic group participants reported a mean score of 4.20 and a median score of 4.50. These values indicate that, on average, participants found studying with the material somewhat easier than they initially anticipated and remembered more easily what they studied with the teacher-made interactive comic. The standard deviations of 1.033 suggest some variability in participants' responses, indicating that while many found the material easier than expected and remembered the content more easily, others may have had differing experiences.

For Item 3, "There were features in this material that made me realize the crucial information", participants reported a mean score of 4.40 and a median score of 4.50. These values suggest that, on average, the interactive comic group participants strongly agreed that the material contained features that facilitated their understanding of crucial information. The standard deviation of 0.699 indicates relatively low variability in participants' responses, implying a consensus among respondents regarding the effectiveness of these features. The range of responses from 3 to 5 demonstrates the spread of perceptions, with most participants rating the presence of these features positively.

For Item 4, "I enjoyed studying with this material", participants reported a mean score of 4.20 and a median score of 4.00. On average, these values suggest that participants found studying with the material enjoyable. The standard deviation of 0.789 indicates some variability in students' responses, suggesting that while many participants enjoyed studying with the material, others may have had differing experiences. The range of responses from 3 to 5 demonstrates the spread of perceptions, with the lowest reported enjoyment being 3 and the highest being 5.

Table 38. Descriptives of IMMS-SU for Interactive Comic Group

Descriptives

							Shapiro-Wilk	
		Mean	Median	SD	Min.	Max.	W	p
1	I studied with this material easier than I expected.	4.20	4.50	1.033	2	5	0.791	0.011
2	I remember more easily what I have studied with this material.	4.20	4.50	1.033	2	5	0.791	0.011
3	There were features in this material that made me realize the crucial information.	4.40	4.50	0.699	3	5	0.781	0.008
4	I enjoyed studying with this material.	4.20	4.00	0.789	3	5	0.820	0.025
5	This material was intriguing.	4.10	4.00	0.876	3	5	0.805	0.017
6	This material allowed me to focus on the topic.	3.90	4.00	1.101	2	5	0.855	0.067
7	I believed that studying with this material would be beneficial.	4.10	4.00	0.738	3	5	0.833	0.036
8	This material has increased my belief that I can be successful.	3.90	4.00	1.101	2	5	0.855	0.067
9	I prefer to study with such materials on complex topics.	4.40	5.00	1.075	2	5	0.647	< .001
10	This material contained interesting properties.	4.60	5.00	0.699	3	5	0.650	< .001
11	This material increased my desire to study.	4.10	4.50	1.101	2	5	0.810	0.019
12	I watched/experienced/read this material with pleasure to the end.	3.80	4.00	0.789	3	5	0.820	0.025
13	I spent less effort studying with this material.	4.20	5.00	1.135	2	5	0.740	0.003
14	It was exciting for me to study with this material.	4.40	4.50	0.699	3	5	0.781	0.008

For Item 5, “This material was intriguing”, participants reported a mean score of 4.10 and a median score of 4.00. These values suggest that the interactive comic group participants found the material to be intriguing. The standard deviation of 0.876 indicates some variability in participants’ responses, implying that while many found the material intriguing, there are also others who may have had differing opinions. The range of responses from 3 to 5 demonstrates the spread of perceptions, with the lowest reported intrigue being 3 and the highest being 5.

For Item 6, “This material allowed me to focus on the topic”, participants reported a mean score of 3.90 and a median score of 4.00. These values indicate that, on average, participants felt the material facilitated their focus on the topic. The standard deviation of 1.101 suggests considerable variability in their responses, implying that while some of the interactive comic group participants found the material effective in promoting focus, others may have had differing experiences. The range of responses from 2 to 5 demonstrates the spread of perceptions, with some participants reporting low levels of focus with a score of 2 while others reported high levels of focus with a score of 5.

For Item 7, “I believed that studying with this material would be beneficial”, participants reported a mean score of 4.10 and a median score of 4.00. These values suggest that, on average, participants held the belief that studying with the material would be beneficial. The standard deviation of 0.738 indicates some variability in participants’ responses, implying that while many believed in the material’s benefits, others may have had differing levels of confidence. The range of responses from 3 to 5 demonstrates the spread of beliefs, with the lowest reported level of belief being 3 and the highest being 5.

For Item 8, “This material has increased my belief that I can be successful”, participants reported a mean score of 3.90 and a median score of 4.00. These values suggest that, on average, participants perceived a slight increase in their belief in their potential for success after engaging with the material. The standard deviation of 1.101 indicates considerable variability in students’ response. The range of responses from 2 to 5 demonstrates the spread of perceptions, with some participants reporting low levels of belief enhancement while others reported higher levels.

For Item 9, “I prefer to study with such materials on complex topics”, participants reported a mean score of 4.40 and a median score of 5.00. These values indicate that, on average, the interactive comic group participants strongly preferred studying with materials similar to the interactive comic, especially when dealing with complex topics. The standard deviation of 1.075 suggests some variability in participants’ preferences, indicating that while many strongly preferred such materials, others may have had differing opinions.

For item 10, interactive comic group participants strongly agreed with the statement “This material contained interesting properties”, giving it an average rating of 4.60. The responses showed relatively low variability with a standard deviation of 0.699, suggesting consistent perceptions among participants. The minimum rating recorded was 3, while the maximum was 5, indicating a high level of agreement overall.

For Item 11, “This material increased my desire to study”, participants reported a mean score of 4.10 and a median score of 4.50. These values suggest that, on average, participants perceived an increase in their desire to study after engaging with the material. The standard deviation of 1.101 indicates considerable variability in participants' responses, implying that while many experienced an increase in desire, others may have had differing experiences or perceptions. The range of responses from 2 to 5 demonstrates the spread of perceptions, with some participants reporting a minimal increase while others reported a substantial increase.

For Item 12, “I watched/experienced/read this material with pleasure to the end”, participants reported a mean score of 3.80 and a median score of 4.00. These values suggest that students experienced some level of pleasure while engaging with the material until the end. The standard deviation of 0.789 indicates some variability in their responses, implying that while many experienced pleasure, others may have had differing experiences. The range of responses from 3 to 5 demonstrates the spread of perceptions, with some participants reporting lower levels of pleasure while others reported higher levels.

For Item 13, “I spent less effort studying with this material”, participants reported a mean score of 4.20 and a median score of 5.00. These values suggest that, on average, participants perceived that they spent less effort studying with the material. The standard deviation of 1.135 indicates considerable variability in participants’

responses, implying that while many perceived a reduction in effort, others may have had differing experiences.

For the last item, “It was exciting for me to study with this material”, the interactive comic group participants reported a mean score of 4.40 and a median score of 4.50. These values suggest that participants found studying with the material to be exciting. The standard deviation of 0.699 indicates some variability in participants’ responses. The range of responses from 3 to 5 demonstrates the spread of perceptions, with some participants reporting moderate levels of excitement while others reported higher levels.

In conclusion, the findings suggest that participants generally perceived the interactive comic positively, finding it engaging, beneficial, and effective in facilitating their learning process. The majority of participants reported that studying with the material was easier than expected, remembered the content more easily, and acknowledged features in the material that helped them understand crucial information. Moreover, participants expressed enjoyment and intrigue while studying with the material, indicating a positive affective response to the learning experience.

However, there were variations in participants’ responses, highlighting the subjective nature of individual experiences with the interactive comic. There were differences in the responses pertaining to the amount of effort and the levels of excitement experienced while studying with the interactive comic. While the majority of responses were positive, there were instances of divergence, suggesting that not all participants had uniform experiences or perceptions.

4.4.1.3. Comparison of the Groups

Table 39 provides an in-depth analysis and comparison of descriptive statistical data pertaining to the experimental groups. This encompasses essential metrics such as averages, middle values, deviations from the mean, and the extent of variability within each group.

Table 39. Descriptives of Group Comparison

Descriptives

		Q	Mean	Median	SD	Minimum	Maximum
1	I studied with this material easier than I expected.	PC	3.90	4.00	0.876	2	5
		IC	4.20	4.50	1.033	2	5
2	I remember more easily what I have studied with this material.	PC	4.20	4.00	0.632	3	5
		IC	4.20	4.50	1.033	2	5
3	There were features in this material that made me realize the crucial information.	PC	4.20	4.00	0.632	3	5
		IC	4.40	4.50	0.699	3	5
4	I enjoyed studying with this material.	PC	4.10	4.00	0.568	3	5
		IC	4.20	4.00	0.789	3	5
5	This material was intriguing.	PC	4.00	4.00	0.943	3	5
		IC	4.10	4.00	0.876	3	5
6	This material allowed me to focus on the topic.	PC	4.30	4.00	0.483	4	5
		IC	3.90	4.00	1.101	2	5
7	I believed that studying with this material would be beneficial.	PC	4.20	4.00	0.632	3	5
		IC	4.10	4.00	0.738	3	5
8	This material has increased my belief that I can be successful.	PC	3.80	4.00	0.632	3	5
		IC	3.90	4.00	1.101	2	5
9	I prefer to study with such materials on complex topics.	PC	4.40	4.50	0.699	3	5
		IC	4.40	5.00	1.075	2	5

Descriptives

		Q	Mean	Median	SD	Minimum	Maximum
10	This material contained interesting properties.	PC	4.50	5.00	0.707	3	5
		IC	4.60	5.00	0.699	3	5
11	This material increased my desire to study.	PC	4.40	4.50	0.699	3	5
		IC	4.10	4.50	1.101	2	5
12	I watched/experienced/read this material with pleasure to the end.	PC	3.40	3.00	0.843	2	5
		IC	3.80	4.00	0.789	3	5
13	I spent less effort studying with this material.	PC	3.70	4.00	0.675	3	5
		IC	4.20	5.00	1.135	2	5
14	It was exciting for me to study with this material.	PC	4.10	4.00	0.738	3	5
		IC	4.40	4.50	0.699	3	5

By comparing the means and standard deviations of the groups, one can observe differences in how participants perceived various aspects of studying with the material. For example, the interactive comic group tended to have slightly higher mean scores for some items like “There were features in this material that made me realize the crucial information” and “This material contained interesting properties”, indicating a potentially more positive perception of these aspects compared to the physical comic group. On average, participants in the interactive comic group reported spending less effort studying with the material compared to those in the first group. On the contrary, the participants in the physical comic group generally reported higher agreement that the material allowed them to focus on the topic compared to the interactive comic group. The lower standard deviation in the physical comic group indicates less variability in responses, suggesting more

consistent perceptions among participants. The physical comic group participants generally reported higher agreement that the material increased their desire to study compared to the interactive comic group. Furthermore, the interactive comic group found studying with the material more exciting than the physical comic group. The participants in the interactive comic group, on average, found it easier to study with the material compared to those in the physical comic group. However, further statistical analysis, such as t-tests or ANOVA, would be needed to determine if these differences are statistically significant . A non-parametric Mann-Whitney U test was employed due to the lack of adherence to the assumptions of normality (Garson, 2012; Hoekstra, et al., 2012). Table 40 provides a concise summary of the comparative analysis being tested and the conclusions drawn based on the chosen significance level.

Table 40. Comparative IMMS-SU Analysis with a Statistical Significance Assessed at $\alpha = 0.05$.

$p > 0.05$	$p \leq 0.05$
There is no difference in the motivational aspects of the materials.	There is a difference in the motivational aspects of the materials.

The independent samples Mann-Whitney U tests conducted on various aspects of participants' experience with the intervention material revealed several outcomes. Table 41 shows the test results of the Mann-Whitney U test.

Table 41. Mann- Whitney U Test Results for IMMS-SU

Independent Samples T-Test

			Statistic	p		Effect Size
1	I studied with this material easier than I expected.	Mann-Whitney U	38.0	0.350	Rank biserial correlation	0.2400
2	I remember more easily what I have studied with this material.	Mann-Whitney U	45.0	0.711	Rank biserial correlation	0.1000
3	There were features in this material that made me realize the crucial information.	Mann-Whitney U	41.0	0.476	Rank biserial correlation	0.1800
4	I enjoyed studying with this material.	Mann-Whitney U	45.0	0.705	Rank biserial correlation	0.1000
5	This material was intriguing.	Mann-Whitney U	47.0	0.840	Rank biserial correlation	0.0600
6	This material allowed me to focus on the topic.	Mann-Whitney U	41.0	0.490	Rank biserial correlation	0.1800
7	I believed that studying with this material would be beneficial.	Mann-Whitney U	46.5	0.800	Rank biserial correlation	0.0700
8	This material has increased my belief that I can be successful.	Mann-Whitney U	45.5	0.749	Rank biserial correlation	0.0900
9	I prefer to study with such materials on complex topics.	Mann-Whitney U	44.0	0.635	Rank biserial correlation	0.1200
10	This material contained interesting properties.	Mann-Whitney U	45.5	0.720	Rank biserial correlation	0.0900
11	This material increased my desire to study.	Mann-Whitney U	44.5	0.681	Rank biserial correlation	0.1100
12	I watched/experienced/read this material with pleasure to the end.	Mann-Whitney U	37.0	0.310	Rank biserial correlation	0.2600
13	I spent less effort studying with this material.	Mann-Whitney U	32.5	0.177	Rank biserial correlation	0.3500
14	It was exciting for me to study with this material.	Mann-Whitney U	38.5	0.365	Rank biserial correlation	0.2300

There were no significant differences found between the groups in memory retention (Item 2), recognition of the crucial information (Item 3), enjoyment of studying (Item 4), finding the material intriguing (Item 5), ranking of the focus (Item 6), belief in the

material's beneficial nature (Item 7), belief in personal success through the material (Item 8), preference for studying complex topics with such materials (Item 9), perception of interesting properties within the material (Item 10), and increased desire to study (Item 11). Participants generally agreed on these items to a similar degree across different conditions, with no strong evidence of a significant difference between groups.

However, the effect sizes, measured in this analysis by the rank biserial correlation coefficient, provide insight into the magnitude of the difference between the groups. A rank biserial correlation coefficient closer to 1 or -1 indicates a stronger association between the grouping variable (e.g., physical comics vs. interactive comics) and the outcome variable (e.g., perceptions of material features, focus on study topics). This suggests that the type of comic used has a more pronounced effect on participants' responses. On the other hand, a value closer to 0 suggests a weaker association (Varma, 2006), implying that any differences observed in responses may be less influenced by the type of comic and more attributable to other factors or random variation.

While there appears to be a slight tendency for participants to perceive material features differently (Item 3) and possibly have varying levels of focus (Item 6) on the study topic depending on whether they used physical or interactive comic, these associations are weak and not statistically significant. This suggests that factors other than the type of comic used may be influencing participants' perceptions and focus during studying.

For Item 1, the rank biserial correlation coefficient of 0.2400 suggests a moderate positive relationship between participants' initial expectations and their perceived ease of studying with the material. However, the *p*-value of .350 indicates that this relationship is not statistically significant at the significance level of 0.05. Therefore, while there is a trend indicating that participants who expected easier studying found it to be so, the observed differences could be due to random variation rather than a systematic effect of the type of comic used. For Item 12, a rank biserial correlation coefficient of 0.2600 and a *p*-value of .310 indicate a moderate positive association between pleasure in studying and the type of comic used. However, this association is not statistically significant. For Item 13, The rank biserial correlation coefficient is

0.3500 with a *p*-value of .177, suggesting a moderate positive association between the type of comic and perceived effort spent studying. Despite the moderate association, the result is not statistically significant. For Item 14, the rank biserial correlation coefficient is 0.2300 with a *p*-value of .365, indicating a weak positive association between excitement for studying and the type of comic used. However, this association is not statistically significant.

In conclusion, while there are some trends suggesting associations between participant responses and the type of comic used, the lack of statistical significance across most measures suggests that any observed differences are not robust and could be influenced by random factors. Incorporating qualitative data alongside quantitative measures provides a comprehensive view of participants' experiences and perceptions. It enhances comprehension regarding the effects of educational comic interventions on learning outcomes and student engagement in ESP courses, particularly examining the differences between physical and interactive comics.

4.4.2.User Experience Survey

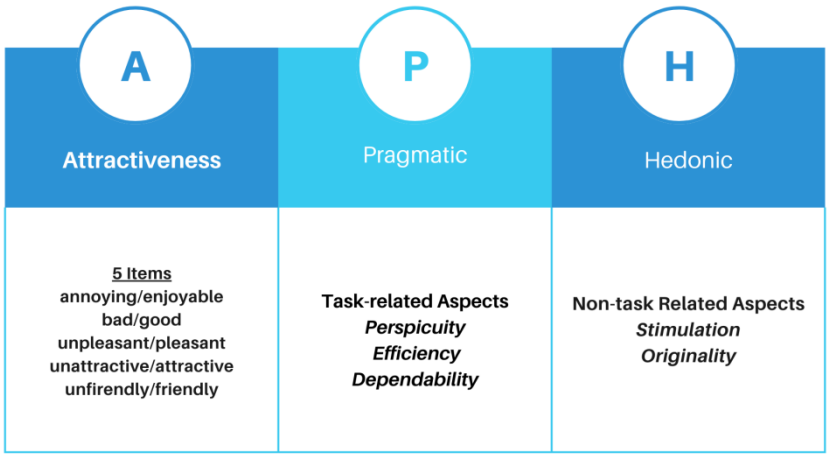
The students' responses can be useful in understanding user perceptions and identifying areas for improvement in the user experience of the final design and launch of the teacher-made comics. The analysis of User Experience Questionnaire (UEQ) was conducted by its own data analysis tool (see *Link*: https://www.ueq-online.org/). In the scale, there are five attributes, which are then classified into three main qualities. When analyzing attributes and quality groups, the researcher used the mean values of user responses.

The main objective of this survey is to gain in-depth understanding of all these aspects. A thorough analysis of the experiential aspects across various characteristics and elements enables a nuanced grasp of the complex nature of user interaction with the intervention materials, thereby highlighting its inherent strengths and weaknesses.

According to the UEQ analysis tool, mean values between -0.8 and 0.8 indicate a neutral evaluation of the scale, while values > 0.8 indicate a positive evaluation and values < -0.8 indicate a negative evaluation. As stated in the data analysis handbook and tool (Schrepp, 2023), when calculating means across a group of users with

varying opinions and response tendencies, values greater than +2 or less than -2 are extremely unlikely. As a result, even a very good value of +1.5 on a scale of -3 to +3 appears less positive.

Figure 38. Distribution of Attractiveness, Pragmatic & Hedonic Quality Attributes of UEQ



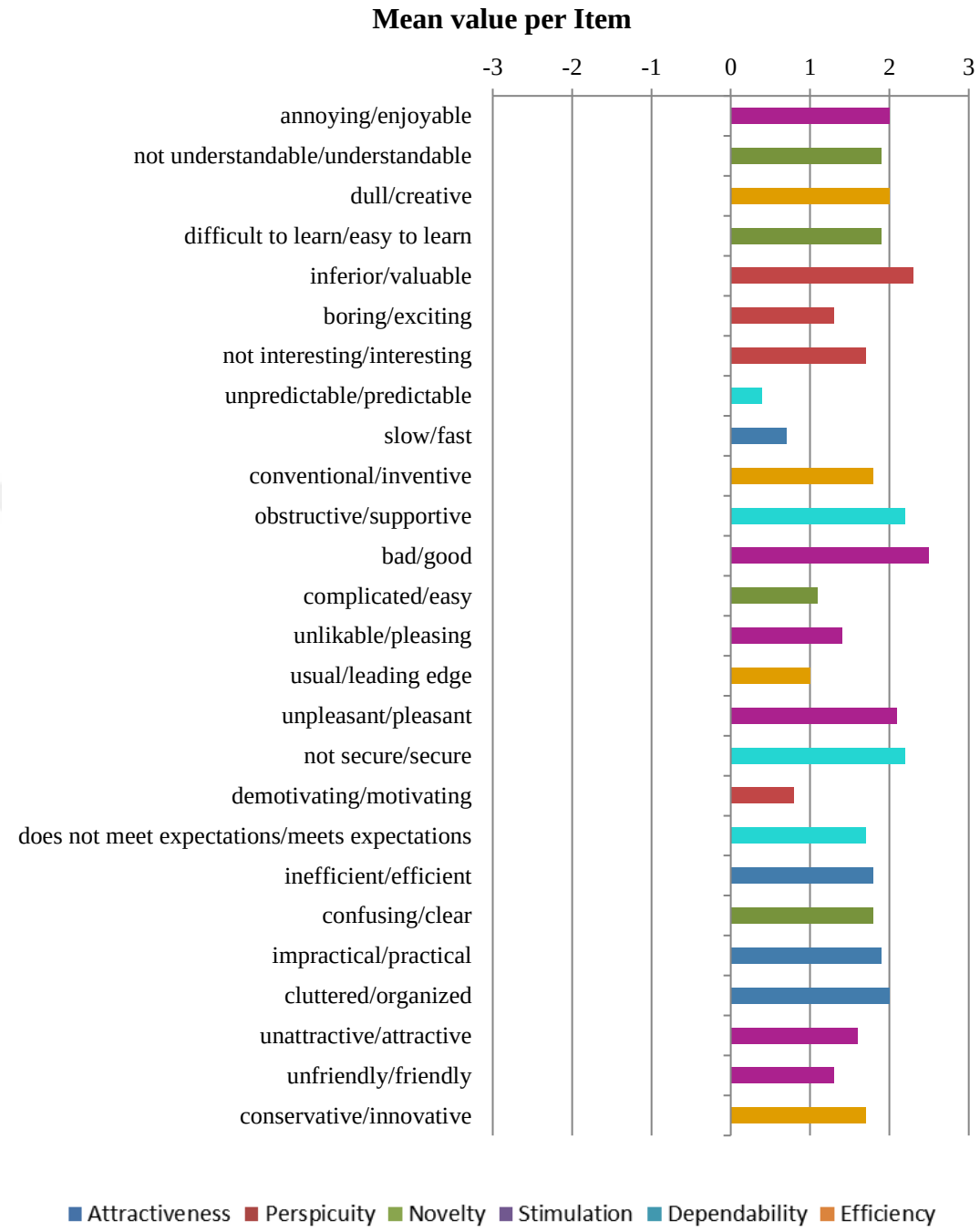
Note: The figure was adapted from the informaiton in "User Experience Questionnaire Handbook", Schrepp, 2023.

Figure 39 tries to illustrate this distribution. In the questionnaire, each item corresponds to an attribute and is classified into five distinct categories. The attributes of pragmatic quality include Perspicuity, Efficiency, and Dependability, whereas hedonic quality includes Stimulation and Originality. Attractiveness is comprised of five components that are individually examined.

4.4.2.1. Physical Comic Group Results

The answers of the physical comic group are presented in Figure 39, which summarizes the average values for each individual item within the user experience questionnaire. This data provide insights into the overall user satisfaction and areas for potential improvement in the user experience. By analyzing these mean values, we can identify specific aspects of the user experience that may need attention or enhancement to ensure a positive and seamless interaction for users. It is useful to carefully consider and interpret these values in order to make informed decisions and implement effective strategies for optimizing the user experience.

Figure 39. Physical Comic Group UEQ Mean Values for Each Item



Note: The figure was retrieved and adapted from UEQ Data Analysis Tool.

In Table 42, the statistical measures of mean and variance for the students' evaluations of Attractiveness and the five different attributes are displayed. The data offer valuable insights into the collective perception of these characteristics among the participants in the physical comic group, facilitating a more profound comprehension of the diverse opinions and preferences within the group. By

analyzing the mean values, we can determine the average perception of each attribute, while the variance indicates the extent to which opinions diverge from this average. This information is valuable for identifying trends, patterns, and discrepancies in the students' responses, shedding light on the factors that influence their perception of Attractiveness and the other attributes.

Table 42. Physical Comic Group UEQ Scales Results

UEQ Scales (Mean and Variance)		
Attractiveness	1,817	0,46
Perspicuity	1,675	0,90
Efficiency	1,600	0,24
Dependability	1,625	0,20
Stimulation	1,525	0,51
Novelty	1,625	0,81

Note: The table was retrieved from UEQ Data Analysis Tool.

The mean score of Attractiveness is moderately high (1.817), suggesting that users find the interface somewhat attractive. The variance is relatively low (0.46), indicating that there is not much variability in users' perceptions of Attractiveness. For Perspicuity, the mean score is moderate (1.675), indicating decent clarity and comprehensibility. However, the variance is relatively high (0.90), suggesting considerable variability in users' perceptions of Perspicuity. The mean score of Efficiency is relatively low (1.600), suggesting that users may perceive the teacher-made physical comic to be less efficient. The variance is low (0.24), suggesting limited variability in users' perceptions of Efficiency. Similarly, the mean score of Dependability is moderate (1.625), indicating average perceptions of the material dependability. The variance is low (0.20), suggesting limited variability in users' perceptions of Dependability. Additionally, the mean of Stimulation is relatively low (1.525), indicating that users may not find the teacher-made physical comic very stimulating or exciting. The variance is moderate (0.51), suggesting some variability in users' perceptions of Stimulation. The mean of Novelty is also moderate (1.625), indicating average perceptions of Novelty. The variance is relatively high (0.81),

suggesting considerable variability in users' perceptions in this attribute. When these attributes are classified under the categories of Attractiveness, pragmatic, and hedonic quality, the ultimate results become apparent.

Table 43. UEQ Attractiveness & Quality Mean Values for Physical Comic

Pragmatic and Hedonic Quality	
Attractiveness	1,82
Pragmatic Quality	1,63
Hedonic Quality	1,58

Note: The table was retrieved from UEQ Data Analysis Tool.

As given in Table 43, Attractiveness has the highest mean, indicating that it was the most highly rated of the three attributes. Pragmatic quality has a moderate mean, indicating that it received intermediate ratings compared to Attractiveness and hedonic quality.

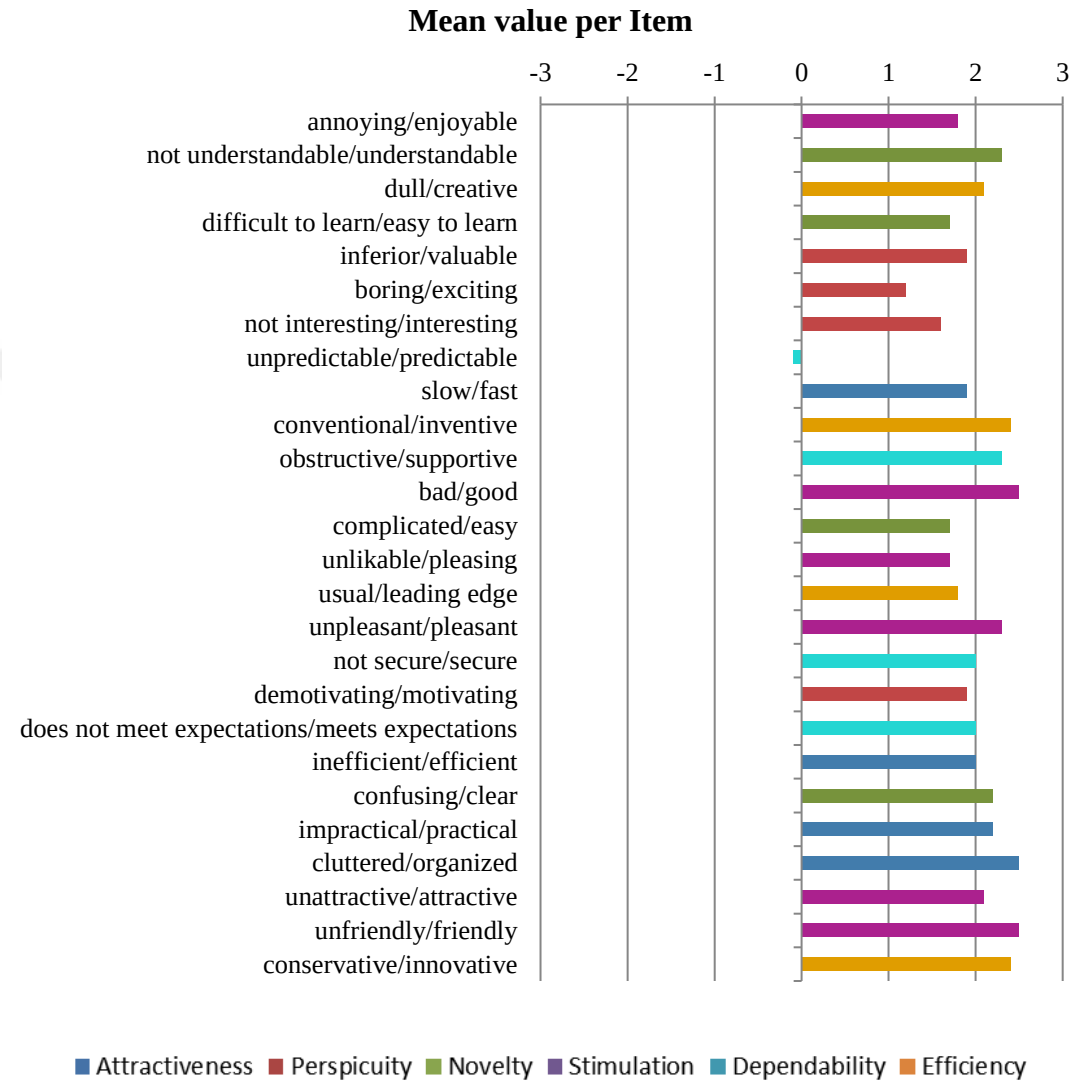
The attribute of hedonic quality obtained the lowest mean score, signifying that it received the lowest average rating among the three attributes. Regarding the user experience, it is possible to say that it is satisfactory in general. However, there appear to be some issues with hedonic quality. To improve the user experience of the teacher-made physical comic, the results suggest that more emphasis should be placed on addressing issues such as Originality and Stimulation in the final design. This will aid in mitigating the concerns associated with hedonic quality, and with continued implementation, it has the potential to enhance the ratings of this attribute in the assessment of the final design. By focusing on these areas, the teacher-made physical comic can become more appealing and captivating, ultimately resulting in a more favorable reception and increased levels of satisfaction.

4.4.2.2. Interactive Comic Group Results

Figure 40 displays the mean values for each item on the UEQ. The data provide insights into user satisfaction levels and identifies specific areas that require improvement for teacher-made interactive comic. This information can be used to

make informed decisions on how to optimize the interactive comic for better engagement and learning outcomes.

Figure 40. Interactive Comic Group UEQ Mean Values for Each Item



Note: The figure was retrieved and adapted from UEQ Data Analysis Tool.

Table 44 displays the average ratings and variability of the students' perceptions regarding Attractiveness and the five associated attributes. The data facilitate a deeper understanding of the interactive comic group's perspectives and inclinations by elucidating their perceptions of these attributes. These data aid in the identification of trends, patterns, and discrepancies in student' responses, unveiling the factors that influence their perceptions of Attractiveness and other attributes.

Table 44. Interactive Comic Group UEQ Scales Results

UEQ Scales (Mean and Variance)		
Attractiveness	2,150	0,67
Perspicuity	1,975	0,55
Efficiency	2,150	0,60
Dependability	1,550	0,58
Stimulation	1,650	1,23
Novelty	2,175	0,70

Note: The table was retrieved and adapted from UEQ Data Analysis Tool.

The mean score of Attractiveness is high (2.150), indicating that users generally find the interactive comic attractive. The variance is moderate (0.67), suggesting some variability in users' perceptions of attractiveness. For Perspicuity, the mean score is relatively high (1.975), indicating good clarity and comprehensibility. The variance is moderate (0.55), suggesting some variability in users' perceptions of perspicuity. The mean score of Efficiency is high (2.150), suggesting that users perceive the interactive comic to be efficient. The variance is moderate (0.60), indicating some variability in user' perceptions of efficiency.

On the other hand, the mean score of Dependability is lower (1.550), indicating that users may have concerns about the system's reliability and other relevant dependability attributes. The variance is moderate (0.58), suggesting some variability in users' perceptions of dependability. Similarly, the mean score of Stimulation is relatively low (1.650), suggesting that users may not find the system very stimulating or exciting. The variance is high (1.23), which reveals considerable variability in users' perceptions of stimulation.

Table 45. UEQ Overall Mean Values for the Interactive Comic Group

Pragmatic and Hedonic Quality	
Attractiveness	2,15
Pragmatic Quality	1,89
Hedonic Quality	1,91

Note: The table was retrieved and adapted from UEQ Data Analysis Tool.

Attractiveness has the highest mean, implying that the students find the experience appealing in general. Pragmatic quality and hedonic quality have slightly lower means than Attractiveness, implying that users rated these qualities slightly less than Attractiveness, but they are still moderately rated.

Overall, these evaluations indicate that users find the teacher-made interactive comic appealing and have positive perceptions of its pragmatic (task-related aspects, such as Perspicuity, Efficiency, and Dependability) and hedonic qualities (Stimulation and Originality), albeit to a lesser extent than its Attractiveness.

4.4.2.3. Comparison of Groups

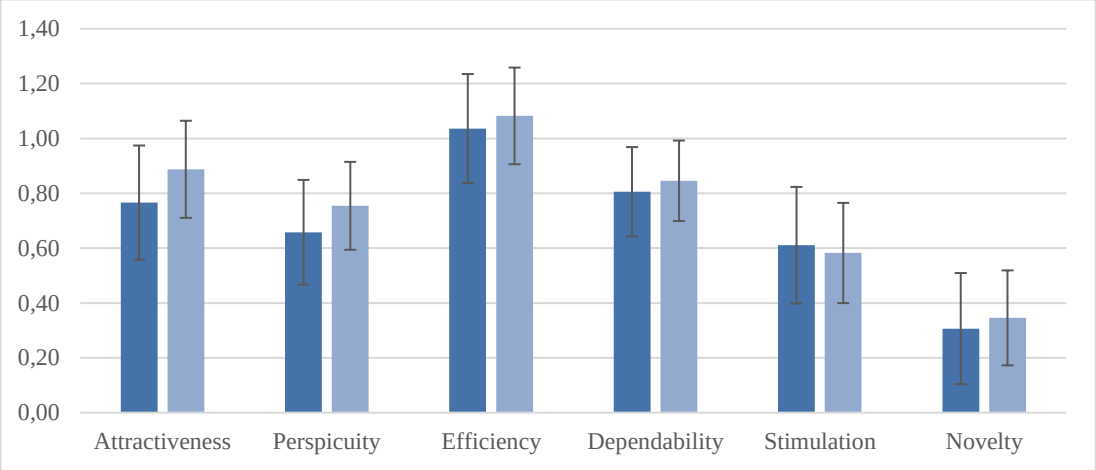
The research conducted a number of comparative analyses among the groups utilizing the *UEQ Data Analysis Tool* and *Jamovi* (version 2.4.11). The initial results were analyzed using the two-sample-t-test, a statistical test available in the *UEQ Data Analysis Tool*. This test assumes unequal sample sizes and is also known as the Welch Test. The Welch t-test is a reliable parametric option for comparing independent samples, capable of effectively handling non-normally distributed data (Lutsky, 1990). The UEQ analysis tool only presents *p*-values for each item without providing the effect sizes of the differences. On the contrary, *Jamovi* was utilized to conduct the same test, as the results of the Welch test in *Jamov*i can yield additional Cohen's effect sizes. Cohen's *d*, an effect size measure in statistical analysis, provides a quantitative assessment of the magnitude of differences between groups, aiding researchers in evaluating the practical significance of their findings (Kelley, 2007). In Cohen's *d*, effect size levels are typically categorized as small, medium, and large, with values around 0.2, 0.5, and 0.8 or greater, respectively, representing each level (Cohen, 1988).

Additionally, *Jamovi* (version 2.4.11) provides descriptive statistics to evaluate the normality and homogeneity across experimental groups. As the research progressed with the use of *Jamovi*, it became apparent that the data followed a non-normal distribution despite the groups displaying homogeneity. Due to the small sample size of the population, the study also utilized a non-parametric approach, specifically the Mann-Whitney test. Consequently, all statistical analyses yielded consistent outcomes, facilitating the assessment of effect sizes.

Analysis with UEQ Data Analysis Tool

Figure 41 presents the mean values obtained from the UEQ assessments conducted within each group. This graphical representation offers a clear depiction of how user experience varied or remained consistent among the different treatments under investigation.

Figure 41. Comparison of UEQ Results



Note: The figure was adapted from the UEQ Data Analysis Tool.

Table 46. Two Sample T-Test Assuming Unequal Variances Results for UEQ Comparison

	***p*-value**	
Attractiveness	0,3348	No Significant Difference
Perspicuity	0,4419	No Significant Difference
Efficiency	0,0767	No Significant Difference
Dependability	0,7919	No Significant Difference
Stimulation	0,7679	No Significant Difference
Novelty	0,1733	No Significant Difference

Note: The table was taken from UEQ Data Analysis Tool.

Table 46 displays *p*-values corresponding to the factors of the scale, accompanied by interpretations that assess the presence of a statistically significant difference for

each factor. According to the interpretations, none of the factors demonstrate statistically significant differences between the compared groups. Attractiveness (p = .3348), Perspicuity (p = .4419), Efficiency (p = .0767), Dependability (p = .7919), Stimulation (p = .7679), and Novelty (p = .1733) all show no significant difference. While some p-values approach marginal significance, none reach the typical threshold of 0.05 for statistical significance. These findings suggest that, based on the provided data, there are no substantial differences in these factors between the compared groups.

Analysis with Jamovi (version 2.4.11)

Table 47. Comparative Descriptives of UEQ Results

Descriptives

	Group	Attractiveness	Perspicuity	Efficiency	Dependability	Stimulation	Novelty
N	PC	10	10	10	10	10	10
	IC	10	10	10	10	10	10
Mean	PC	1.82	1.68	1.60	1.63	1.52	1.63
	IC	2.15	1.98	2.15	1.55	1.65	2.17
Median	PC	1.92	2.00	1.63	1.63	1.38	1.25
	IC	2.33	2.25	2.38	1.50	2.00	2.25
SD	PC	0.677	0.951	0.489	0.445	0.712	0.899
	IC	0.818	0.740	0.775	0.762	1.11	0.834
Shapiro-Wilk W	PC	0.991	0.943	0.940	0.917	0.913	0.834
	IC	0.915	0.858	0.883	0.949	0.885	0.898
Shapiro-Wilk p	PC	0.997	0.591	0.555	0.335	0.302	0.038
	IC	0.318	0.073	0.139	0.655	0.149	0.207

The Shapiro-Wilk test yielded *p*-values ranging from .997 to .038 for physical comic group variables, suggesting normality for the first five variables ($p > 0.05$) but significant deviation from normality for the sixth variable, Novelty, ($p = .038$).

The study conducted robust parametric (Welch's t-test) and non-parametric (Mann-Whitney U) tests to assess differences in several attributes among groups. Table 48 provides a concise summary of the comparative analysis being tested and the conclusions drawn based on the chosen significance level while Table 49 provides parametric and non-parametric test results.

Table 48. Comparative UEQ Analysis with a Statistical Significance Assessed at $\alpha = 0.05$.

$p > 0.05$	$p \leq 0.05$
There is no difference between the *IC* and *PC* groups with respect to the dependent variable Attractiveness and other user experience attributes	There is a difference between the *IC* and *PC* groups with respect to the dependent variable Attractiveness and other user experience attributes

Table 49. Parametric and Non-parametric Independent Samples T-Test for UEQ Group Comparison

Independent Samples T-Test

		Statistic	df	p		Effect Size
Attractiveness	Welch's t	-0.991	17.4	0.335	Cohen's d	-0.443
	Mann-Whitney U	36.0		0.306	Rank biserial correlation	0.2800
Perspecuity	Welch's t	-0.787	17.0	0.442	Cohen's d	-0.352
	Mann-Whitney U	40.0		0.467	Rank biserial correlation	0.2000
Efficiency	Welch's t	-1.899	15.2	0.077	Cohen's d	-0.849
	Mann-Whitney U	25.5		0.068	Rank biserial correlation	0.4900
Dependability	Welch's t	0.269	14.5	0.792	Cohen's d	0.120
	Mann-Whitney U	48.0		0.909	Rank biserial correlation	0.0400
Stimulation	Welch's t	-0.300	15.4	0.768	Cohen's d	-0.134
	Mann-Whitney U	42.5		0.595	Rank biserial correlation	0.1500
Novelty	Welch's t	-1.418	17.9	0.173	Cohen's d	-0.634
	Mann-Whitney U	32.5		0.194	Rank biserial correlation	0.3500

Statistical Significance Assessed at $\alpha = 0.05$.

Table 49 presents the results of statistical analyses, including Welch's t-test and Mann-Whitney U test, alongside effect size measurements for various factors such as Attractiveness, Perspicuity, Efficiency, Dependability, Stimulation, and Novelty. The analyses aimed to assess potential differences between groups concerning these factors. The results suggest that, in the majority of cases, both Welch's t-test and the

Mann-Whitney U test did not identify any statistically significant differences between the groups for most factors. The effect sizes, which quantify the extent of observed effects, typically fell within the small to moderate range. This indicates that although there may be some differences, they may not have practical significance.

Both tests suggest there is no significant difference in Attractiveness between the groups. The small Cohen's *d* indicates that while there may be a measurable difference in Attractiveness, it is not large. The data also indicate that there is no statistically significant difference in Perspicuity between the experimental groups, although there may be some minor differences as suggested by the effect size (Cohen's *d* = -0.352) and correlation measures. For Stimulation, the very small Cohen's *d* value (-0.134) indicates an almost negligible effect size, suggesting an extremely minor difference in Stimulation between groups.

It is worth mentioning that the test for Dependability yields a high *p*-value (.909), indicating a lack of statistical significance. Moreover, the effect size (Cohen's *d* = 0.120) is small, further supporting the conclusion that there is no substantial difference in Dependability between the compared groups. For the variable Novelty, the statistical test yields *p*-values of .173 and .194, which are above the significance level of 0.05. Despite the lack of statistical significance, the effect size (Cohen's *d* = -0.634) indicates a moderate practical significance. This suggests that while the statistical test does not detect a significant difference, the effect size suggests a noteworthy practical impact in terms of Novelty. Therefore, it may be prudent to consider the practical implications alongside the statistical results when interpreting the findings related to Novelty. By considering both the theoretical implications and the practical implications, a more comprehensive understanding of the significance of Novelty in the context of teacher-made physical comic can be achieved. This holistic approach ensures that the findings are not only statistically significant but also practically relevant, providing a well-rounded perspective on the topic.

Notably, the Efficiency factor showed marginal significance in the Welch's t-test, indicating a potential difference that warrants further investigation. It is also important to note that the effect size (Cohen's *d*) for Efficiency is relatively large (-0.849), indicating a notable practical significance despite the lack of statistical significance. A Welch's *t*-value of -1.899 indicates that there is a difference between

the means of the two independent groups being compared. The negative value suggests that the mean of physical comic group is lower than the mean of the interactive comic group. Therefore, while the statistical test does not detect a significant difference, the effect size indicates a meaningful practical impact. This implies that even though the results may not be statistically significant, the magnitude of the effect is still meaningful for teacher-made physical comic in practical terms. It is essential to consider both the statistical significance and practical relevance when examining research findings in the joint discussion of the results.

4.5. Focus Group Discussions

This section provides a thematic analysis of the data collected from each of the focus group discussions. The analysis begins with a brief summary of the findings, followed by the categorization of the themes and the distribution of the codes. In order to provide a comprehensive understanding of the participants' opinions and constructs, direct quotes from their responses were also incorporated for each category. Following this, each theme is explained in line with the students' responses.

4.5.1. Physical Comic Group

The thematic analysis highlights participants' perspectives on the advantages and challenges of using comics in education, as well as their recommendations for future use and improvements. During focus group discussions, the participants highlighted the humor and the dialogic nature of comics, which make learning enjoyable and aid in memory retention. However, the teacher-made physical comic has received criticism for having a restricted set and style of images and a lack of interactivity, which is believed to lead to monotony. Despite these drawbacks, participants acknowledge the benefits of comics in cultivating their design terminology and enhanced understanding of complex concepts. They suggested incorporating interactive elements and tailoring content to individual learning needs to improve the effectiveness of comics in education. Overall, there is a positive shift in attitude towards educational comics, with participants recognizing their potential as valuable educational tools.

The process of thematic analysis, entailing a meticulous review of the student contributions, was facilitated through the utilization of precise codes. These codes were methodically associated with overarching themes pertinent to the content. The complex interrelationships between the codes and the themes were presented in a tabular layout, providing a thorough depiction of the analytical methodology utilized in the research.

Table 50 delves into the inductive analysis of the themes and codes derived from the students' responses. It presents quotations, codes, and recurring themes to offer a comprehensive overview of the findings of the thematic analysis. The abbreviation PC refers to group "physical comic" while "Location" denotes the precise position and numbering of the student quotes in the transcript (see *Appendix* O for the transcript).

Table 50. Physical Comic Group: Inductive Thematic Analysis

SAMPLE QUOTES	CODES	THEMES
"The positive and advantageous aspect of this could be that it presents something in a much more humorous way and it includes visuals. And this is something that keeps us from getting bored." (PC-Interview, Location 15) *"So, in order to make learning less boring, I can use comics as a learning method."* (PC-Interview, Location 53) *"Especially to break the monotony, it can be applied for both theoretical and practical lessons."* (PC-Interview, Location 63) *"It might be a bit more enjoyable if we turn it into a comic."* (PC-Interview, Location 66) *"Let's say we finished the class and are on our way. It would be very enjoyable. You could even open it and look at it while on the road."* (PC-Interview, Location 67) *"It seems to me that explaining design programs through visualizations might be more fun." (*PC-Interview, Location 71)	#humor and learning #ease of learing #multimodal learning #accessibility #design education and comics	Increased Engagement and Enjoyment Pedagogical Adaptability and Integration
"Our understanding of terminology has grown as we encountered both familiar and new words. We could also say that we have expanded our vocabulary by using words we were already familiar with but were unaware of." (PC-Interview, Location, 32) *"All I was learning were single words and particular phrases. But thanks to the comics, I realized how some elements in a sentence might entirely alter the meaning. This made me feel like I was not just learning one thing at a time, but rather absorbing the information thoroughly. In this sense, it was more beneficial to me."* (PC-Interview, Location, 37) *"Although I had some familiarity with professional terminology,*	#ease of learning #contextual learning #enhanced learning experience #vocabulary expansion #critical	Enhanced Professional Vocabulary and Improved Learning Experience Deeper Engagement with the Material

I struggled to explain it when needed. For instance, I knew what "accessibility" meant, but I could not articulate it. Now, I have learned enough to explain this term in English. In general, I have learned all the terminology. It has been beneficial to professional language " (PC-Interview, Location 48) *"The instructor was constantly asking questions, and it required some time to think and answer those questions. If it had been in the form of an article, I would have read it like any other book, constantly absorbing information. But because it was in the form of a comic, it made me think more and analyze more deeply."* (PC-Interview, Location 49) *"In a professional context, we saw how the concepts we already knew or were learning could be effectively used within the context of a comic. I believe the fundamental benefit lies in this aspect. Even though we could learn a lot from a written list of these terms, understanding them in their context is necessary to turn them into meaningful sentences that the other person can comprehend. The comic did a great job, in my opinion, of giving this background."* (PC-Interview, Location 47)	thinking #deepens comprehension	
"For instance, there is a lot of information in the comic, and when I visualize it as scenes, certain details spring to me. I found that it was much easier to remember because it was visual. For example, when I saw the question "affordance," the image that went along with it instantly sprang to my mind, and I was able to recall it that way."(PC-Interview, Location 16)	#ease of learning #multimodal learning #vocabulary expansion	Improved Memory and Engagement through Multimodality
"As previously stated, we may feel a little more a part of that environment if the interaction proceeds in a way in which you read and we follow, or even in a more sequentially interactive manner between our friends and you. I believe we will feel more involved and active if it moves forward more interactively." (PC-Interview, Location 84)	#need of interaction #cons of self-reading	The Importance of Interactive Learning Experiences in Fostering a Sense of Connection and Engagement Isolation in Learning

"We do a lot of self-reading; we get tired of that individuality. There were times when I wondered if we should have looked at it together." (PC-Interview, Location 15). *"But maybe if we had read it together, and someone else had recited the teacher and the student, it might have been more enjoyable."* (PC-Interview, Location 17) *"Generally, when you see a topic presented in a narrative form, it sticks in your mind much more easily. But because we were doing it alone, it became difficult to keep it going."*(PC-Interview, Location 21) *"After the third page, it started to feel a bit overwhelming. I was more excited while reading the first three pages."*(PC-Interview, Location 45)	#need of interaction #cons of self-reading #storytelling and retention #cognitive load #feedback	Isolation in Learning The Importance of Interactive Learning Experiences in Fostering a Sense of Connection and Engagement
"I think interactive and visual content enhances our learning experience." (PC-Interview, Location 56) *"I believe that adding different add-ons and features, both audio and visuals and making it more stimulative, will appeal to the new generation."* (PC-Interview, Location 83)	#multimedia integration #digital vs. physical	Enhancing Learning and Active Participation Through Interactive Elements and Multimedia Experience
"Similar to my friends, I found the limited number of pictures to be somewhat uninteresting. There is only one scene that I can recall." (PC-Interview, Location 25) *"Because of the colors, it appeared the same. The brown and black color scheme accentuated the lack of distinction of the scenes."* (PC-Interview, Location 26)	#feedback #visual design	Feedback on Visual Design
"The inclusion of additional visuals could potentially mitigate the monotony." (PC-Interview, Location 22)	#informed improvements	Further Suggestions and Improvements
"I am not someone who reads a lot of comics in daily life. But when I do read, it is mostly for enjoyment...I have seen that comics can be beneficial to my professional and educational life. I saw that comics can be used not only for arbitrary purposes but also for educational purposes." (PC-Interview, Location 52) *"Let us say there is a topic. It is too complicated for me, and I am having difficulty. When I go online to learn about it, I can google if there is a comic book about the topic."* (PC-Interview, Location 53)	#ease of learning #improved attitude #perception change	Changing Attitudes and Perceptions towards Educational Comics

"The information design course is more focused on principles, so comics could be utilized there. Nevertheless, a course in design history or art history with a dense amount of information could be quite intense. I believe comics cannot be convenient for classes with a plethora of theoretical stuff. However, it could be used in both theoretical and practical courses, particularly to break up the monotony. It could help to make the content more memorable." (PC-Interview, Location 63) *"For example, we took art history and design theory courses in our first year, and I believe it could be especially useful in these courses. It would benefit us both in terms of design and theory. It is not enjoyable to read from a slide."* (PC-Interview, Location 65) *"Narrative-structured content tends to capture people's attention. Overall, most of our courses are appropriate for this."* (PC-Interview, Location 68) *"During the first three weeks of the Fundamentals of Usability course, we talked about what questions we should ask about user experience and what we should focus on. When teaching these things, comics can be used to demonstrate the things we need to consider."* (PC-Interview, Location 70)	#design education and comics #applied vs theoretical courses #storytelling and engagement #multimodal learning	The Role of Comics in Tertiary Level Design Education Engagement through Multimodality Pedagogical Adaptability and Integration

The key pivotal themes that are crucial to the scope of the present study are outlined in detail.

Increased Engagement and Enjoyment

Students expressed that the teacher-made physical comic provided a more enjoyable and engaging way of learning, making complex topics more accessible and interesting. The majority of students emphasized that comics enhance enjoyment and entertainment in the educational experience.

Improved Memory and Engagement through Multimodality

Visual elements in comic books aid in better understanding and retention of information, particularly through scenery and imagery that depict complex concepts. Visual aids and cues in comics prompt memory recall and aid in understanding abstract concepts.

Pedagogical Adaptability and Integration

Students favored the use of comics as supplemental learning materials to complement traditional teaching methods, enriching curriculum content and

enhancing student engagement. The participants underlined that comic books offer versatility in tertiary level design education, with potential applications across various subjects and learning objectives.

Isolation in Learning

Some students conveyed sentiments of isolation or disconnection when engaging with comic books individually, suggesting the need for balanced learning experiences that accommodate both individual and collaborative learning approaches.

The Importance of Interactive Learning Experiences in Fostering a Sense of Connection and Engagement

The responses of students suggest that comic books could serve as catalysts for collaborative discussions and group activities, promoting peer learning and knowledge sharing. For students, comics can encourage interactive learning experiences through engagement with visual narratives, fostering active participation and exploration. However, the majority of students found the teacher-created comic to be lacking in these aspects.

Enhancing Learning and Active Participation Through Interactive Elements and Multimedia Experience

Students proposed incorporating interactive features such as clickable elements or animations to further engage users and enhance learning experiences. Suggestions also included integrating additional characters and supplement the visual content and cater to diverse learning preferences.

Feedback on Visual Design

Several students voiced their discontent with the restricted variety of visuals in the teacher-made comics, proposing that a broader and more intricate range of illustrations could enhance understanding and improve egagement. Students also indicated that the lack of diverse visual elements in comic books can result in uniform interpretations among readers, potentially limiting critical thinking and discussion within the classroom.

Further Suggestions and Improvements

Students' suggestions on design emphasize the importance of interactivity, accessibility, personalization, collaboration, and gamification in enhancing the effectiveness and appeal of comic books as educational tools.

Changing Attitudes and Perceptions towards Educational Comics

There is a noticeable change in students' perceptions of comics as educational tools. Initially, some students may have viewed comics primarily as entertainment or recreational reading material. However, through the interventions, students have come to recognize comics as effective tools for learning and knowledge sharing. They acknowledge the potential of comics to foster collaborative discussions, promote peer learning, and enhance interactive learning experiences. Additionally, students suggest incorporating interactive features and multimedia elements into comics to further engage users and cater to diverse learning preferences. This shift in perception highlights the evolving recognition of comics as valuable educational resources rather than mere sources of entertainment. Students, on the other hand, expect educational comics to be both informative and entertaining. Some students have also opined that a comic book should not be overly dependent on written dialogue.

The Role of Comics in Applied and Theoretical Courses in Tertiary Level Design Education

The majority of students expressed dissatisfaction with the lack of physical materials in their design courses, as well as the absence of multimodal resources. It was suggested that educational comic books could be beneficial for understanding design principles and theories, especially when applied in a more interactive and visually engaging way. Participants mentioned that the visual nature of comic books aids in understanding and retaining information, making them suitable for lessons related to information design and art history. The interactive and visual aspects of comic books were highlighted as advantageous for learning about user experience design. Students also expressed that the visual storytelling aspect of comic books can enhance learning in applied graphic design courses.

4.5.2. Interactive Comic Group

In the focus group discussion, the majority of participants, from a broader perspective, perceived interactive comics as valuable supplementary tools, particularly in courses that heavily depend on slide presentations, as they can enhance learning and facilitate understanding. Participants emphasized the importance of accommodating individual learning paces and preferences, suggesting that interactive comics could offer a flexible learning environment where students could progress at their own speed. There were also differing opinions on when interactive comics should be introduced, with some preferring to access them before class for better preparation, while others found post-class usage more beneficial for reinforcing learning. Participants highlighted the importance of feedback mechanisms within interactive comics, such as interactive quizzes and notifications, to help them identify and correct mistakes, enhancing the learning experience. Some participants reflected on their personal learning experiences and noted that interactive comics provided a novel and effective approach to learning, challenging preconceived notions about the suitability of comic-based learning methods in university settings. Concerns were also raised regarding the implementation of interactive comics in large classrooms, with participants suggesting the need for a moderator to ensure that all students remain synchronized and engaged while others found the idea distracting.

Table 51 presents the correlations between the codes and the themes concerning the students' responses. The abbreviation IC refers to the group "interactive comics" while "Location" denotes the precise position and numbering of the student quotes in the transcript (see *Appendix* P for the transcript).

Table 51. Interactive Comic Group: Inductive Thematic Analysis

SAMPLE QUOTES	CODES	THEMES
"It sounds a little scary since you are not sure how well you know the professional terms. When I saw them in the comic, my opinion of it was altered ." (IC-Interview, Location 50) *"It gave me confidence when reading articles. When I was reading, I began to rely more on foreign sources, believing that I was already familiar with them."* (IC-Interview, Location 51) *"Learning similar words from written sources made comprehension difficult. The fact that it was a more common language with dialogues allowed me to understand the words confidently without becoming overly tired."* (IC-Interview, Location 54) *"Studying those sentences in the first few weeks of class had left me feeling biased. I often worried that I wouldn't be able to read or understand them. However, the comic made the experience much more enjoyable." (IC-Interview, Location)*	#ease of learning #building confidence #storytelling and retention #multimodal learning #bring enjoyment to the learning experience	Enhanced Retention and Understanding Breaking Professional Language Preconceptions and Building Confidence
"As a result, I was able to concentrate longer. Naturally, given my limited English proficiency, I did not fully comprehend it; however, seeing it in visual form improved my understanding. As a disadvantage, it would be preferable if it were a page like this, allowing the conclusion to be seen. The attention span fades after a while. Besides that, it does, in fact, make the focus last longer." (IC-Interview, Location 28)	#focus #multimodal learning #enhanced learning #feedback #attention	Improved Focus and Attention Enhanced Retention and Understanding Mixed Views on Structure and Navigation
"I was able to understand how I would typically use the terms that we had learned in the theoretical lessons when they were presented in a dialogue." (IC-Interview, Location 49).	#storytelling and retention #vocabulary expansion	Enhanced Retention and Understanding
"Interactive comics can be effectively integrated into theoretical lessons. Clarity of the content can be improved. Interactive comics can be also used in other courses which cover spatial information. It would be preferable to present this information using interactive comics." (IC-Interview, Location 63). *"It appears that this is not applicable, particularly in our applied lessons. However, in our theoretical lessons, Usability Fundamentals included all of the terms we see presently. We were also having trouble understanding. If we had a comic book to start with, we would be able to understand the terms better. It can be also used in art history."* (IC-Interview, Location 62).	#lack of multimodal supplementary materials #design education and comics	The Role of Comics in Applied and Theoretical Courses in Tertiary Level Design Education Demand of Supplementary Multimodal Materials in Tertiary Level Design Education

"We have lessons that are based on too many slides. For example, there is one lesson that we only take in English, and I do not remember anything from it. I proceed through each slide, forgetting what I learned in the previous one. I believe one of the reasons for this is that I lack a solid understanding of the English concepts covered in the course. The other is that it is packed with text. Regardless of before and after, having an additional resource might make our job easier." (IC-Interview, Location 86). *"I would like to see comics as I struggle with remembering and understanding terminology. Instead of tedious YouTube videos, an interactive comic book can be used to create a more step-by-step learning method. I get bored watching YouTube videos, particularly those that are long."* (IC-Interview, Location 83).	#design education and English #design education and comics #lack of multimodal supplementary materials	Importance of English in Design Education Demand of Supplementary Multimodal Materials in Tertiary Level Design Education The Role of Comics in Applied and Theoretical Courses in Tertiary Level Design Education
"I have almost never read a comic book before." (IC-Interview, Location 6) *"For example, I was unaware that there was such a thing as educational comics."* (IC-Interview, Location 57) *"My viewpoint has changed. It was not something I particularly enjoyed. But now I see that it has become more useful."* (IC-Interview, Location 59) *"I mean, I have never read educational comics before, and I met it with this opportunity."* (IC-Interview, Location, 56) *"If you do not know much about the subject, comic books appear to be more relatable to children. Even though that is not the case. And I liked how comics can be utilized to instruct students in the university setting."* (IC-Interview, Location 102)	#improved attitude #perception change #comics experience	Changing Attitudes and Perceptions towards Educational Comics
"I found it beneficial to observe, learn, and switch back and forth. If I didn't understand something, I could go back and forth." (IC-Interview, Location *39)* *"For example, sometimes in lessons, something comes up and goes by quickly. I don't have the opportunity to go back and think about it, or that missed opportunity slips away. This method gave me more room to go back and review."* (IC-Interview, Location 40) *"It helped me to understand better when I read, reviewed, and also supported with visuals."* (IC-Interview, Location 41) *"I think it could be very beneficial in online classes. Because everyone is already looking at the same screen from their own homes."* (IC-Interview, Location 70) *"I believe that having something like this prior to the lesson would be a better option for me."* (IC-Interview, Location 84)	#flexibility #adaptability #personalized learning	Flexible and Inclusive Learning Experience

The key pivotal themes that are crucial to the scope of the present study are provided in detail.

Enhanced Retention and Understanding

Participants noted that interactive comics improved their retention and understanding of course material. Design terminology was found to be more memorable, aiding in the recall of specific pages and content. Reading and experiencing terminology within the context of a narrative helped participants better understand and internalize abstract concepts. Many participants indicated a preference for multimodal learning, noting that reading and seeing words helped them better understand and remember the material. The combination of visual elements and textual content in interactive comics was particularly found effective in reinforcing learning.

Improved Focus and Attention

Participants highlighted that interactive comics enhanced their ability to focus and maintain attention during learning activities. They felt that the format increased their concentration and prolonged their engagement with the material. The conversational style and inclusion of characters in the comics contributed to a sense of dialogue and engagement, facilitating a deeper understanding of the material.

Flexible and Inclusive Learning Experience

Participants emphasized the importance of accommodating individual learning paces and preferences, suggesting that interactive comics could offer a flexible learning environment where students could progress at their own speed. Participants valued the flexibility afforded by interactive comics, especially when studying outside the classroom. For some, using this format at home allowed for more personalized and effective learning experiences.

Breaking Professional Language Preconceptions and Building Confidence

The use of comics challenged participants' preconceived notions about the complexity of professional terminology, helping them realize that they could understand and grasp these concepts effectively, thereby boosting their confidence in their English reading skills.

Changing Attitudes and Perceptions towards Educational Comics

Participants' attitudes towards educational comics shifted positively as they realized the effectiveness of the medium in enhancing their understanding and retention of complex concepts. Participants who previously had little or no exposure to comics or held negative attitudes towards them reported a change in perception, recognizing their value and effectiveness in facilitating learning.

Mixed Views on Structure and Navigation

While participants generally appreciated the immersive storytelling and visual appeal of the interactive comic, a majority of them expressed concerns about the lack of clear structure and navigation features. Not being able to see the total number of pages or easily track progress led to feelings of uncertainty and occasional disorientation. While participants appreciated the visual storytelling approach of interactive comics, some expressed a desire for more visual examples to further aid in understanding.

The Role of Comics in Applied and Theoretical Courses in Tertiary Level Design Education

Participants noted that the use of interactive comics could improve the learning experience in theoretical courses, reducing the need for extensive note-taking and increasing engagement with the material. The students highlighted the absence of constructivist methodologies in their theoretical classes, underscoring their passive engagement in the instructional process.

Demand of Supplementary Multimodal Materials in Tertiary Level Design Education

Students underscored the importance of engaging, interactive learning resources, such as comics, in facilitating comprehension, retention, and enjoyment of course material. They suggest that shifting away from text-heavy, passive learning formats towards interactive, visually engaging methods could enhance the learning experience and improve outcomes for learners.

Further Suggestions and Improvements

Some students suggested that additional visual representations of concepts and connections could enhance the learning experience even further.

Participants discussed the potential benefits of integrating multimedia elements such as animation and sound into interactive comics to enhance comprehension and engagement with the material.

In conclusion, group members expressed openness to further experimentation and innovation in interactive comic usage, suggesting that they could be used not only as supplementary resources but also as integral components of classroom instruction. The participants exhibited a strong desire for the continued use of interactive comics in future classes, highlighting their potential to enhance learning experiences and support diverse learning styles in university education.

5. INTEGRATION OF DATA AND DISCUSSION OF THE RESULTS

5.1. Introduction

This chapter tries to synthesize significant research findings through the utilization of both quantitative and qualitative data alongside with outcomes, a brief discussion, and implications. The results are presented at the aggregate or group level.

5.2. Research Question 1

What are the effects of teacher-made physical comic and interactive comic interventions on the enhancement of communication design students' reading skills and learning experiences?

5.2.1. Sub-Research Question 1

To what extent do the intervention materials impact communication design students' comprehension of design terminology and learning process?

Impacts on the Comprehension of Design Terminology

Teacher-made physical comic and interactive comic interventions have equally positive impacts on enhancing communication design students' professional language by making contribution to their understanding of design terminology and concepts.

Quantitative Data from Pretest-Posttest Assessments of Physical Comic Group: The statistical analysis utilizing the Wilcoxon signed-rank test revealed significant differences between pre-test and post-test scores for all three assessments: Assessment 1 (p = .006), Assessment 2 (p = .005), and Assessment 3 (p = .008). On average, the scores increased by 17.5, 15, and 20 points, respectively. These findings suggest a consistent and notable improvement in academic performance following the intervention across the assessed parameters.

Quantitative Data from Pre-Test–Post-Test Assessments of Interactive Comic Group: The Wilcoxon signed-rank test showed significant differences between pre-test and post-test scores for all three assessments: Assessment 1 (p = .008), Assessment 2 (p = .012), and Assessment 3 (p = .005). On average, scores increased by 15.5, 17, and 21 points respectively.

Comparative Evaluation: The Kruskal-Wallis test revealed no significant differences between pre-test and post-test scores across all three assessments between experimental groups: Pre-test 1 (χ^2 = 0.0947, p = .758), Post-test 1 (χ^2 = 0.1916, p = .662), Pre-test 2 (χ^2 = .9060, p = .341), Post-test 2 (χ^2 = 0.0768, p = 0.782), Pre-test 3 (χ^2 = 0.0243, p = .876), and Post-test 3 (χ^2 = 0.8145, p = .367). The effect size (ε^2) ranged from 0.00128 to 0.04768, indicating minimal to small effect sizes across the assessments. Therefore, there were no statistically significant differences observed in the outcomes between pre-test and post-test measurements across the assessed parameters of the experimental groups. Both of the intervention materials that were utilized in the study were determined to have an equal level of effectiveness in aiding participants in recalling and retaining design terminology and concepts. The positive impact of both materials on the participants' ability to remember and comprehend the key information was evident throughout the pretest-posttest assessments.

Quantitative Data from IMMS-SU: Participants in both groups reported comparable ease in remembering what they studied with the intervention materials (Item 2). The interactive comic group had an average score of 4.20, which was the same as the physical comic group's average score. In the physical comic group, participants indicated a strong preference for studying with these materials on complex topics (Item 9), with an average score of 4.40 and a median of 4.50. The standard deviation was 0.699, suggesting relatively consistent responses among participants. The lowest score recorded was 3, while the highest was 5, indicating a high level of preference for using these materials for complex topics. Similarly, in interactive comic group, participants also expressed a preference for studying with these materials on complex topics (Item 9), with an average score of 4.40 and a median of 5.00. The standard deviation was slightly higher at 1.075, indicating some variability in responses. The lowest score recorded was 2, and the highest was 5, suggesting a strong preference for using interactive comics for complex subjects.

Qualitative Data from Physical Comic Group: "It also helped me learn vocabulary. Because we do not know what most words actually mean." (PC-Interview, Location 36)

"After we finished reading the comics, you gave us test papers. I could not respond well before reading comics, but after reading, I could." (PC-Interview, Location 41)

Qualitative Data from Interactive Comic Group: "I believe it has made design terminology more catchy. I recall exactly what was written on those pages. This has been a significant advantage for me." (IC-Interview, Location 23)

"Certainly, my comprehension was limited due to my inexperience with the language; however, it gradually improved as the material was visualized." (IC-Interview, Location 28)

Outcome: The implementation of the intervention materials in the classroom had a significantly positive effect on the students' language learning experiences. As a result, there was a noticeable improvement in their academic performance and a significant enhancement in their proficiency in professional design terminology. The students were able to engage more effectively with the learning materials, leading to a deeper understanding of the language concepts being taught. This, in turn, translated into better grades and a higher level of confidence in using the language in real-world scenarios. Overall, the results suggest that the intervention materials played a crucial role in shaping the students' language learning journey and preparing them for success in their academic and professional endeavors.

Further research with a larger sample size may be needed to draw more definitive conclusions. Conducting longitudinal studies could provide more insights into the long-term effects of the intervention materials. Exploring different demographic groups may reveal potential variations in the effectiveness of the intervention materials. Finally, further research with a larger sample and the analysis of the data using advanced statistical methods could yield more nuanced results.

Discussion: In both groups, the participants stated that comics improved their understanding and the recall of the course content, pertaining to design terminology and concepts. Students underlined that learning design terminology within a narrative context helped them grasp and retain abstract concepts better. It suggests that incorporating design terminology within a narrative context can improve retention,

comprehension, and recall of the course content. Additionally, it highlights the effectiveness of using multimodal and narrative-based approaches for teaching abstract concepts, potentially leading to more engaging and impactful learning experiences.

Implication: Integration of physical comics and interactive comics into English for design purposes courses has been shown to have significant benefits in improving learning outcomes. The present study has shown that both physical and interactive comics are equally efficacious in facilitating the development of reading skills and fostering targeted vocabulary acquisition in the domain of design. Therefore, it is recommended that educators teaching ESP consider incorporating comics into their curriculum as a valuable tool for teaching design concepts and terminology. By doing so, students can engage with the material in a more interactive and visual way, leading to a deeper understanding and retention of the subject matter.

Impacts on Learning Process

Quantitative Data from IMMS-SU: "This material has increased my belief that I can be successful", the mean rating for the physical comic group was 3.80 with a median of 4.00 and a standard deviation of 0.632. In comparison, the interactive comic group had a mean rating of 3.90, a median of 4.00, and a standard deviation of 1.101. This suggests that both groups generally rated the material similarly in terms of increasing their belief in their own potential for success. However, the standard deviation for the interactive comic group is higher, indicating greater variability in responses within that group compared to the physical comic group.

Qualitative Data from Physical Comic Group: While not explicitly discussed in terms of "confidence", the positive experiences and engagement with comics reported by the participants suggest that using comics as an educational tool can contribute to building students' confidence in their learning abilities and academic success. Although the phrase "belief in success" did not appear in the students' responses, physical comic participants expressed a general sentiment of feeling more capable and successful in their learning endeavors through various comments about the effectiveness and enjoyment of using comics as educational materials.

"The positive and advantageous aspect of this could be that it presents something in a much more humorous way and it includes visuals. And this is something that keeps us from getting bored." (PC-Interview, Location 15)

"Visuals made the experience enjoyable for me as well. I did not feel like I am doing something forced; I did not feel like I had to learn something." (PC-Interview, Location 17)

"We observed the interplay between words and terms. This method effectively communicates the explanations to us by critiquing the narrative, thereby revealing the shape of our actual observations" (PC-Interview, Location 35)

"The three-week process allowed me to learn more comfortably than when I was not as familiar with the theory." (PC-Interview, Location 50)

Qualitative Data from Interactive Comic Group: Participants in the interactive comic group conveyed a profound correlation between their learning experience and a diverse array of favorable attributes linked to their interactive comic experience. This was also reflected in the coding process, where inductive codes such as building confidence, experiencing personalized learning opportunities, finding ease in the learning process, and noticing an increase in their abilities were highlighted as important aspects to consider. Moreover, in the focus group discussion, participants spent a significant amount of time discussing the various ways interactive comics can be used in teaching, as well as how they can be used in educational and personal settings, emphasizing their educational benefits.

"When I read this, particularly at home rather than in class, I also find that I am far more productive. I frequently used this approach, particularly when I was preparing for tests and the words would not stick in my head. This way would allow me to learn more. Having ourselves as the third person in a conversation was pleasant. Better still would have been if the number of pages could have been visible." (IC-Interview, Location 32)

"When I was reading, I began to rely more on foreign sources, believing that I was already familiar with them." (IC-Interview, Location 51)

"Studying those sentences in the first few weeks of class had left me feeling biased. I often worried that I wouldn't be able to read or understand them. However, the comic made the experience much more enjoyable." (IC-Interview, Location 53)

"It helped me digest the words confidently without getting too tired." (IC-Interview, Location 54)

"With a system like that, I am free of chaos, and my ability to learn grows." (IC-Interview, Location 65)

Outcome: Considering the abundance of students' feedback on their learning experiences, it is reasonable to conclude that the teacher-made interactive comic has offered learners more comprehensive and flexible learning experiences. This has led to increased engagement, motivation, and retention of information among students. The interactive nature of the comic allows for personalized learning opportunities and immediate feedback, catering to individual student needs and preferences. As a result, students felt more empowered and in control of their learning journey, ultimately leading to better academic outcomes and a deeper understanding of the material.

Discussion: The participants in the physical comic group tended to attribute their learning experiences more to humor, narrative, and pleasure compared to those in the interactive comic group. They correlate these factors with the facilitation of learning and the enhancement of their educational experiences. This difference may stem from the paper-based reading experience. None of the participants in the interactive comic explicitly mentioned "humor" but they did indicate that the storytelling enabled their retention and they have assumed the role of the third character. The reason for this is that the user requested to input their names, and as a result, the narrator frequently addressed them by their name. On the other hand, the interactive comic group may have been more focused on the technology-driven aspects of their reading experience, potentially overshadowing the traditional storytelling elements that the physical comic group valued. This suggests that the mode of content delivery can greatly influence the manner in which students perceive and interact with the information being presented to them. Nevertheless, this could also be construed as a manifestation of a stereotype. In other words, it could be attributed to the prevailing perception and anticipation that comics are inherently linked with humor.

Implication: The affordances provided by interactive comics may have the potential to greatly improve participants' vocabulary and cognitive connections, ultimately leading them to be more expressive in conveying their learning experiences. It is

critical to conduct further research to understand how different formats can influence students' perceptions and interpretations of their learning process, allowing for a more comprehensive analysis of their impact on their learning experiences.

5.2.2. Sub-Research Question 2

Do interventions differ in motivational factors and how they affect the user experience?

Motivational Aspects of the Teacher-Made Comic

Teacher-made physical comic and interactive comic interventions have been found motivating. Although there is no statistical differences in motivational aspects of the intervention materials, additional quantitative data from UEQ and the qualitative data obtained from focus group discussions suggest that interactive and multimedia integrated comics have been found more desirable and engaging.

Comparative Analytical Analysis: The Mann-Whitney U test results of IMMS-SU indicate a small effect size in the difference between physical comic and interactive comics, with the physical comic group having lower values. However, this difference is not statistically significant at a 5% significance level. Therefore, based on the results, we cannot conclude that there is a significant difference between physical comic and interactive comic in terms of their impact on IMMS-SU scores. Further research with a larger sample size may be needed to draw more definitive conclusions.

Quantitative Data from IMMS-SU: The data reveals that both groups reported an increase in their desire to study after engaging with the material. In the physical comic group, the mean score was 4.40, with a median of 4.50, indicating a strong agreement among participants regarding the material's ability to enhance their motivation to study. Similarly, in Group IC, the mean score was 4.10, with a median of 4.50, suggesting a consistent perception of increased desire to study among participants in this group as well.

When asked about their level of enjoyment engaging with the material until completion, the physical comic group rated it at a mean of 3.40, while the interactive comic group rated it higher at 3.80. Participants found studying with the interactive comic easier than expected, with a mean of 4.20. Participants also found studying

with physical comic easier than expected, but slightly lower compared to interactive comic, with a mean of 3.90. In the physical comic group, participants reported an average score of 3.90, with a median of 4.00 and a standard deviation of 0.876, indicating some variability in responses. The lowest score recorded was 2, while the highest was 5, suggesting a range of experiences regarding the ease of studying with the material. Additionally, the interactive comic was found to be more intriguing, with a mean of 4.10.

Quantitative Data from UEQ: In User Experience Questionnaire (UEQ), the mean value of Stimulation attribute for interactive comic group (1.650) is higher than that of physical comic group (1.525). This suggests that, on average, participants in interactive comic group experienced higher levels of stimulation compared to those in the physical comic group.

Qualitative Data from Physical Comic Group: None of the students mentioned the word "motivation" explicitly during any of the interviews. For physical comic group, participants' positive responses and suggestions for improving engagement suggest that comics have the potential to positively influence motivation by making learning more enjoyable and accessible. Conversely, the majority of the members of the physical comic group expressed dissatisfaction with the limited range of visuals in the physical comic, suggesting that more diverse and detailed illustrations could enhance comprehension and engagement. Additionally, students suggest incorporating interactive features and multimedia elements into comics to further engage users and cater to diverse learning preferences. One participant suggested that while they enjoyed the concept, they would prefer more amusing images for better engagement. Another participant acknowledged the potential for enhancing the experience through captivating design but cautioned against implementing it in every lesson to avoid monotony. Additionally, nearly half of the participants commented on the color scheme of the comics, suggesting that altering it could improve student interaction. One of the participants also highlighted the changing preferences of the younger generation, emphasizing the importance of visually appealing content due to shorter attention spans. They suggested that interactive elements could enhance engagement and activity levels among students. The following excerpts from the focus group discussion were chosen to present the students' ideas:

"Maybe not with these images, but I would definitely like to see it applied to images that are more amusing. I think that would be a lot of fun." (PC-Interview, Location 75)

"If the design were to be altered and made more captivating, it could enhance the experience. However, it may not be feasible or desirable to implement this in every lesson, as it could become tiresome." (PC-Interview, Location 78)

"In my opinion, the comics' color scheme might be altered. It had a charming style. I felt there was a very low level of student interaction." (PC-Interview, Location 28)

"I would especially say this for the younger generation. People are approaching more visually appealing things and their attention span is getting shorter. They are unable to read a book without any sound or open applications even when they are reading it." (PC-Interview, Location 54).

"If we interact with our friends and you more, I believe we will feel more engaged and active." (PC-Interview, Location 81)

"I read manga, and there are some apps for that. For example, when you press a button, it skips the page, and there are sometimes shortcuts... I believe that adding different add-ons and features, both audibly and visually, and making it more simulative, will appeal to the new generation." (PC-Interview, Location 83).

Qualitative Data from Interactive Comic Group: The students expressed several motivating factors regarding the use of interactive comics in education. They highlighted the engagement and enjoyment that interactive comics could bring to learning, noting that the combination of visual storytelling and educational content could be particularly appealing to students. Additionally, they emphasized the importance of interactive elements such as quizzes and mini-games in making the learning process more dynamic and enjoyable, likening it to gamification. Personalization was also cited as a significant factor, with adaptive learning features being seen as valuable for catering to individual student needs and interests. Moreover, the students underscored the potential of comics to illustrate real-world scenarios, thereby enhancing the relevance of the content and increasing student motivation. Overall, they believed that by providing positive and engaging learning experiences, interactive comics could effectively motivate students to actively participate in their education.

"*I find it difficult to engage in theoretical discussions during regular classes. In English, a single missing word can change the meaning. I found it beneficial to observe, learn, and switch back and forth. If I didn't understand something, I could go back and forth. Even when inquiring about something, people may be hesitant to ask the same question again".* (IC-Interview, Location 39)

Even though I didn't know the word, the explanation with pictures helped me understand it. More examples, though, could make the material more understandable. (IC-Interview, Location 44)

"This would also be useful for me because I have difficulty recalling and understanding terminology. Aside from that, while we were discussing it, another thing came to my mind. For example, the programs we use include some instructions, such as "click here". By incorporating an interactive comic, one can create a more detailed learning experience than boring YouTube videos." (IC-Interview, Location 83)

"I believe these are concepts (here the student refers to interactive learning) *that should not be too far apart. However, nothing like this has happened since I started college. I believe this is far more efficient."* (IC-Interview, Location 105)

Outcome: Conducting an investigation into the motivational aspects of the intervention materials using targeted interview questions could yield valuable insights. Furthermore, this suggests that assessing motivational aspects requires qualitative data, as qualitative methods are deemed more dependable in capturing the intricate experiences and viewpoints of the research participants. This requires a careful and intentional consideration of multiple components, such as artistry, storytelling structure, character development, and thematic depth in the motivational aspects of the comics. By immersing themselves in the personal stories and lived experiences of individuals, researchers can gain a more holistic understanding of the complex interplay between motivation and various contextual factors of the educational comics. This in-depth exploration of motivational aspects not only enhances the validity and reliability of the research findings but also provides valuable insights for designing educational comics interventions and programs that effectively support and enhance motivation in different settings. Furthermore, certain

components of the UEQ have proven to be valuable in providing a deeper understanding of the motivational aspects of the teacher-made educational comics.

Discussion: The meticulous design of adult educational comics involves a thoughtful and deliberate approach to various elements, including artwork, narrative structure, character development, and thematic content. Based on the excerpts, it is also evident that comics or any other multimodal materials should be adapted to the evolving preferences and behaviors of the today's students, who are increasingly drawn to visually engaging and interactive content. This suggests a need for educational materials, such as comics, to adapt to these changing preferences by incorporating more captivating visuals and interactive features. Additionally, there is an acknowledgement of the potential benefits of interactive elements in promoting engagement and activity among students, indicating a desire for more dynamic and participatory learning experiences.

Implication: While the same images were used for the design of the intervention materials, the interactive comic group participants did not provide any direct suggestions for refining the visual design of the interactive comic, which was presented in a one-panel layout. In this context, it is possible to draw the conclusion that additional design may be required when university instructors use comic creation platforms to create physical comics for their students. This implies that the standard features and layout designs offered by such platforms may not fully meet the needs or expectations of designer-teachers, prompting them to incorporate supplementary design components to enhance the quality or effectiveness of their print-based educational materials.

User Experience of the Teacher-Made Comic

Comparative Evaluation of Groups: The results of comparative analytical analysis suggested no difference in mean values between the two groups. However, for the Novelty attribute, Cohen's *d* value is -0.634, indicating a moderate effect size. This suggests a noticeable impact of Novelty on user perception, potentially influencing students' experiences. Thus, enhancing the novelty of teacher-made physical comic could be crucial for improving user satisfaction. Moreover, a notable Cohen's *d* value of -0.85 for Efficiency highlights a substantial difference in mean values between the groups, indicating its importance in influencing user experience.

Quantitative Data: Upon analyzing the metrics of pragmatic and hedonic quality, as well as Attractiveness, within both physical comic and interactive comic groups, distinct differences become apparent. The participants in the interactive comic group had a higher average rating in the survey in comparison to the physical comic group. Specifically, the mean Attractiveness score in interactive comic group (M = 2.15) surpassed that of physical comic group (M = 1.82), indicating a stronger perception of visual appeal among interactive comic respondents. Similarly, interactive comic group participants reported higher mean scores for pragmatic quality (M = 1.89) and hedonic quality (M = 1.91) compared to the physical comic group, where the corresponding mean scores were lower (Pragmatic quality: M = 1.63; hedonic quality: M = 1.58). This suggests a more favorable evaluation of the material's functional and experiential aspects among respondents in the interactive comic group in contrast to those in the physical comic group. The mean Dependability score for physical comic is 1.65, with a standard deviation of 0.20. This indicates that the scores tend to cluster relatively closely around this mean, with less variability compared to the interactive comic group. The mean dependability score for the interactive comic group is also 1.65, but with a higher standard deviation of 1.23. This means that the scores are more widely dispersed around this mean, indicating greater variability in the dependability of the interactive comic compared to the physical comic.

Quantitative Data 2: The comparison of mean ratings in IMMS-SU between the two groups reveals interesting insights into their experiences with the material. While both groups reported generally positive perceptions, the interactive comic group consistently rated their experiences slightly higher than the physical comic group across various dimensions. For instance, the interactive comic group members expressed a higher level of pleasure in experiencing the material to the end, with a mean rating of 3.80 compared to 3.40 in the physical comic group. Similarly, the interactive comic group participants indicated that they spent less effort studying with the material, with a mean rating of 4.20, compared to 3.70 in the physical comic group. Additionally, the interactive comic group reported higher levels of excitement in studying with the material, with a mean rating of 4.40, compared to 4.10 in the physical comic.

Qualitative Data from Physical Comic Group: The excerpts from the focus group discussion illuminate the role of aesthetic and hedonic attributes, such as Stimulation and Originality, in shaping the user experience of physical comics, which in turn may influence task-oriented elements like Perspicuity, Efficiency, and Dependability.

"The inclusion of additional visuals could potentially mitigate the monotony." (Location, 22)

"Similar to my friends, I found the limited number of pictures to be somewhat uninteresting. There is only one scene that I can recall." (PC-Interview, Location 25)

"Because of the colors, it appeared the same. The brown and black color scheme accentuated the lack of distinction of the scenes." (PC-Interview, Location 26)

"I read comics for the first time. I was confused because I was not familiar with it. I had difficulty understanding the reading order." (PC-Interview, Location 27)

Qualitative Data from Interactive Comic Group: The majority of participants expressed apprehension about the lack of a progress indicator in the interactive comic (IC-Interview, Location 23; 27; 30; 32; 33; 34). These implications underscore the dependability of the system by ensuring a uniform and anticipated user interaction. Hence, the students' feedback concerning the dependability of the interactive comic was chosen from the focus group discussion.

"I'm tempted to jot down notes on unfamiliar subjects. That might work against me." (IC-Interview, Location 31)

"I think it would be better if features such as seeing the number of pages, taking notes, and words we don't recognize appeared when we clicked on them." (IC-Interview, Location 33)

"I didn't focus on the number of pages, but I used the back button a lot to ensure unity with the other pages." (IC-Interview, Location 35)

"In general, reading helps me understand English better than hearing it. When I read it, took it back and forth, and reinforced it with a visual, it became more clear in my mind." (IC-Interview, Location 41)

"I find it difficult to engage in theoretical discussions during regular classes. In English, a single missing word can change the meaning. I found it beneficial to observe, learn, and switch back and forth. If I didn't understand something, I could

go back and forth. Even when inquiring about something, people may be hesitant to ask the same question again." (IC-Interview, Location 39)

Outcome: When compared to interactive comic, physical comic requires a greater amount of attention to be paid in order to further improve its user experience. It is essential to make refinements to the visual aspects of the physical comic. This modification is necessary to enhance the overall reading experience and visual appeal of the teacher-made physical comic.

Discussion: These findings suggest that the interactive component of the material may have contributed to a more engaging and enjoyable learning experience for the second group, potentially reducing perceived effort and enhancing overall excitement during interventions. In the physical comics, this can be achieved by a well-thought-out design layout. It can help to better convey the story and the content depicted in the teacher-made comics. Therefore, it is important to carefully consider and implement these modifications to ensure that the physical comics are as effective and impactful as possible. In further comparative studies, the cognitive load can be measured. This can be accomplished through a variety of techniques including eye-tracking technology, imaging scans, and self-report questionnaires, yielding deeper understanding of the differences between physical comic book reading and interactive digital comic reading (Apostolou & Linardatos, 2023; Cohn, 2013; Dunst et al., 2018; Kumar & Dhar, 2023; Rochette et al., 2016). Participants may also be asked to compare how much effort they put into each format by being exposed to both.

Implication: Examine and evaluate the recommendations and suggestions provided by the students regarding the ultimate design of the physical comic. Consider their input carefully to ensure that the final-design meets the expectations and preferences of the target audience. Take into account the various ideas and perspectives shared by the students in order to create a comprehensive and well-rounded design that resonates with the target audience.

5.2.3. Sub-Research Question 3

How do teacher-made comics interventions influence students' perceptions and attitudes towards learning through the comics medium?

Quantitative Data from RCEP Results of Physical Comic Group: The data came from in-class online comics survey conducted shortly before the interventions. Physical comic participants had a somewhat positive attitude toward the idea of improving their professional knowledge by reading comic books (M = 3.90). The median response is 4.50. This suggests that the median value of responses is slightly higher than the mean, indicating a possible right-skewed distribution, with some participants holding more positive views about using comic books to improve professional knowledge. The standard deviation is equal to 1.595. This value represents the dispersion, or variability, of responses around the mean. A higher standard deviation indicates that responses are more widely dispersed from the mean, indicating a range of opinions within the group. To summarize, participants in the physical comic group had moderately positive attitudes toward various aspects of comics use. The average rating ranges from 3.90 to 5.10, indicating a generally positive outlook. The median values are close to the mean, indicating relatively balanced response distributions. The standard deviations range from 1.101 to 1.636, indicating that opinions vary moderately within the group.

Qualitative Data from Physical Comic Group: Notably, the students' perceptions about comics appear to have evolved positively throughout the interventions. The table below includes excerpts from the students' focus group discussions (see *Table* 50). Initially, some group 1 participants mentioned feeling skeptical or unsure about the effectiveness of using comics in education. However, as they engaged with the material, many began to appreciate the benefits of comics, such as their potential to make learning more enjoyable, increase engagement, and enhance understanding of complex topics. They highlighted the visual appeal of comics, their ability to break the monotony of traditional teaching methods, and their effectiveness in facilitating learning and retention of information. Some participants expressed a shift in perception towards seeing comics as a valuable tool for education, particularly in enhancing understanding of theoretical concepts and improving language skills. To sum up, there was a growing appreciation for the use of comics as educational resources, as well as recognition of their potential to enhance the learning experience.

"I read comics for the first time." (PC-Interview, Location 27 (see also Location 59)).

"I am not someone who reads a lot of comics in daily life. But when I do read, it's mostly for enjoyment...I have seen that comics can add something to my professional and educational life. I saw that comics can be used not only for arbitrary purposes but also for educational purposes." (PC-Interview, Location 52)

"Let us say there is a topic. It is too complicated for me, and I am having difficulty. When I go online to learn about it, I can ask Google if there is a comic book about the topic." (PC-Interview, Location, 53)

"I agree with my friends. Just think how useful it would be to learn Ottoman history through a comic book." (PC-Interview, Location, 55)

"I, like my friend, had no idea comics could be used in education. I believe its application would be extremely beneficial." (PC-Interview, Location, 58)

"I had not read comics before, so I found it enjoyable. For example, I thought the visualization of the educational tools was great. When you visualize something, you remember it. When you don't forget the images, you also don't forget the words." (Location, 59)

"I did not have any previous experience with comics, especially in educational context. I tried it for the first time here." (PC-Interview, Location, 60)

"Educational comics are logical. I think they have the potential to be used in a variety of teaching contexts." (PC-Interview, Location, 61)

Quantitative Data from RCEP Results of Interactive Comic Group: Group 2 participants were positive about the idea of improving their professional knowledge by reading comic books (M = 4.30). The median response (4.00) is slightly lower than the mean, indicating a fairly balanced distribution of opinions. Responses vary moderately (SD = 1.252), indicating a range of opinions within the group. Participants in the interactive comic group exhibited more favorable perceptions compared to those in the physical comic group. The mean rating ranges from 4.00 to 5.40, indicating a generally positive attitude toward comic book usage. The median values closely align with the mean, suggesting a balanced response distribution. The standard deviations range from 0.949 to 1.418, indicating that the group's opinions are relatively consistent.

Qualitative Data from Interactive Comic Group: The qualitative data obtained from focus group discussion suggests a shift in perspective regarding the perceived value and utility of comics in educational contexts (*see* Table 51). Some participants expressed a lack of prior exposure to educational comics and a limited understanding of their potential benefits. However, their viewpoints evolve as they encounter educational comics within the presented opportunity. They have come to recognize that comics can be utilized as powerful educational instruments, even within the realm of higher education, despite the initial assumption that they are primarily intended for a younger audience. This suggests an increased appreciation for the versatility and educational value of comics.

"I have almost never read a comic book before." (IC-Interview, Location 6)

"For example, I was unaware that there was such a thing as educational comics." (IC-Interview, Location 57)

"My viewpoint has changed. It was not something I particularly enjoyed. But now I see that it has become more useful." (IC-Interview, Location 59)

"I mean, I have never read educational comics before, and I met it with this opportunity." (IC-Interview, Location 56)

"If you do not know much about the subject, comic books appear to be more relatable to children. Even though that is not the case. And I liked how comics can be utilized to instruct students in the university setting." (IC-Interview, Location 102)

Outcome: The results indicate a shift in perception and attitude towards comics, particularly their potential for use in educational settings. The participants expressed an appreciation for comics as not only forms of entertainment but also as valuable tools for learning and comprehending complex concepts. Their willingness to investigate educational comics, despite their limited prior exposure, demonstrates an openness to incorporating alternative learning methods into their academic endeavors. Furthermore, the participants recognize comics' versatility in a variety of fields of study, emphasizing their ability to improve both practical and theoretical aspects of education through engaging and accessible content. This change in viewpoint underscores the transformative influence of engaging with comics in an academic setting, suggesting an increased recognition of comics as credible educational tools.

Discussion: Educational comics were a novel concept to the targeted university-level design students, despite the ubiquitous appeal of comics in the broader context. This could indicate a gap in awareness or exposure to the potential educational benefits offered by comics, especially among those who may not typically associate comics with learning or academic content. To address this lack of familiarity, it may be necessary to increase visibility and promote the educational value of comics through targeted initiatives, educational campaigns, or curriculum integration efforts to expand their use and recognition within educational contexts in tertiary level design education.

Implication: The diversity in perspectives could stem from factors such as individual learning styles, prior experiences with comics, or differing expectations regarding their efficacy in the educational context. Addressing these disagreements and prejudices through open dialogue and exploration of underlying concerns could lead to a more nuanced understanding of the potential benefits and challenges associated with integrating comics into educational practices. Moreover, it underscores the importance of considering student perspectives and engaging them in the decision-making process when implementing comic-based learning and teaching methods.

5.3. Research Question 2

What are the opinions and recommendations of communication design students regarding the prototype of teacher-made physical comic and its interactive counterpart; both as users and informants?

Quantitative Data from UEQ Results of Physical Comic Group: The mean value of Pragmatic Quality (1.63) indicates a moderate level of pragmatic quality. This suggests that while the teacher-made physical comic may serve its practical purpose to a reasonable extent, there might be some room for improvement or optimization; it is functional, yet there may have some minor issues that could be addressed. The average hedonic quality score of 1.58 indicates a moderate level of aesthetic appeal. This indicates that the teacher-made physical comic provides some level of enjoyment or emotional appeal, but there may be aspects that could enhance the overall experience further. The mean value of Attractiveness (1.82) suggests a relatively high level of attractiveness. It is contradictory. However, this indicates that participants may even find the material generally aesthetically pleasing or interesting.

Qualitative Data from Physical Comic Group: While participants recognized the educational value of comics, they also provided feedback for improvement. For the physical comic, suggestions included making the content more accessible to learners of different proficiency levels (PC-Interview, Location, 85), layout design (PC-Interview, Location 45, 75) changing color palette (PC-Interview, Location 26, 28), integration of different visuals (PC-Interview, Location 22, 25) and incorporating interactive elements to enhance engagement (PC-Interview, Location 56, 83). Moreover, the participants' responses implied the importance of socio-constructivist approaches for reading comics in ESP classroom (PC-Interview, Location 15, 17, 18, 28, 81).

Outcome: Both quantitative and qualitative data indicate the necessity for adjustments and enhancements in the design of the physical comic. Based on the feedback obtained from physical comic participants, specific strategies were identified to enhance the effectiveness of the physical comic by carefully focusing on the panel layout and elements of visual composition.

- **High-priority:** Enhance the layout design of the comics to improve readability and comprehension by adjusting the arrangement of panels, font sizes, and spacing to make the content more visually appealing and easier to follow.
- **High-priority:** Consider changing the color palette used in the comics to make them more visually engaging and appealing to the target audience by experimenting with different colors that complement the content and enhance readability.
- **Low-priority:** Work on improving the overall visual appeal of the comics by refining the illustrations and backgrounds.

Discussion: The study did not include any teaching practice and was solely designed to test the effectiveness of the material; no action was taken in response to the students' comments regarding interaction and presentation of the material. The material already includes an interactive version tailored to accommodate students with diverse learning preferences. However, students' ideas on the potential instructional applications will be taken into consideration in the forthcoming classroom implementations. This also indicates the need to incorporate socio-constructivist learning approaches into the design and implementation of teacher-made physical comics.

Implication: The study recommends making changes to the default printouts on comics design platforms, especially when the target audience is adult learners. By taking into account the feedback from communication design students, efforts have been made to elevate the educational value and effectiveness of the teacher-made physical comic using *Adobe Photoshop* (desktop version 25.7, Adobe™) (see *Appendix* M, mentioned earlier in section 3.9.).

Quantitative Data from Interactive Comic Group: The high score for attractiveness (2.15) suggests that the content is visually appealing and captures the attention of the participants. This indicates that the presentation of the material is engaging and aesthetically pleasing. The scores for pragmatic quality (1.89) and hedonic quality (1.91) indicate moderately positive perceptions regarding the content's functional and emotional aspects, respectively. The evaluation suggests that while the content may be visually attractive and moderately effective in fulfilling its practical and emotional functions, there may still be room for improvement in enhancing its pragmatic and hedonic qualities to further enhance user satisfaction and engagement. The responses from students reveal that the responses representing predictability leans slightly towards unpredictability, as indicated by a mean value of -0.1. This indicates that students find the quality being measured to be more unpredictable than predictable.

Qualitative Data from Interactive Comic Group: The qualitative information complements the quantitative data obtained from the UEQ analysis. The students' responses elucidate a prevalent desire among participants for the incorporation of page numbering or a means to discern the total page count within the teacher-made interactive comic (IC-Interview, Location 23, 27, 30, 32, 33, 34). They discussed the potential implications for user engagement. The group mostly agreed that resolving this issue should be the top priority for improving the user experience. Furthermore, there were supplementary remarks made, albeit of a personal nature and pertaining to interactive comics in general, which do not warrant immediate action.

From a personal perspective, they also recommend integrating visual exemplars (IC-Interview, Location 44, 45), hovering texts (IC-Interview, Location 33) and gamified elements within comics to enhance interactivity and immersion (IC-Interview, Location 78, 94). Participants provided insightful viewpoints on the utilization of educational interactive comics in higher education, highlighting their integration into the educational system and discussing possible strategies to enhance their overall

effectiveness (IC-Interview, Location 45, 93). Additionally, they stressed the importance of a feedback-oriented approach in developing comic applications, suggesting constructive guidance through mistakes to facilitate understanding and improvement (IC-Interview, Location 96). Lastly, they also emphasized the importance of stimuli and prompts within comic applications to sustain user engagement and enhance their usability and efficacy as educational tools (IC-Interview, Location 97).

"For example, specific visual examples can be provided. If they include more questions and resemble to a game, I think they could be much more effective." (IC-Interview, Location 94)

"Increasing the number of tests and interactive elements, in my opinion, also prevents something. If, when we get distracted, it prompts us with a notification to refocus, it could be more useful." (IC-Interview, Location 97)

Discussion: The lack of a dynamic progress bar or a visual guide instilled a sense of uncertainty regarding the advancement of the interactive comic, leading to feelings of ambiguity and distraction. The students underlined the importance of page numbering and progress mapping as critical in imbuing the reading experience with a sense of structural coherence and facilitating a more lucid understanding of one's positional progression within the content. The students proposed incorporating page numbers as a potential remedy to alleviate the aforementioned feelings of uncertainty and disquietude by providing readers with insight into the overall scope of the material and their relative advancement therein.

Outcome: Based on the feedback provided by the participants, the following actions were defined to improve the educational value of the teacher-made interactive comic:

- **High-priority:** Include a progress bar that visually represents the user's progression through the content. This bar can indicate the proportion of the material already viewed and provide a sense of how much remains.
- **Low-priority:** Integration of pre-test and post-test questions at the end of each section implies a structured assessment approach, allowing for the evaluation of students' comprehension and retention of the content.
- **Low-priority**: Integrating the embedded hyperlink within the program directly into the interactive comic, removing the option for users to choose whether or not to view the video and instead making it an inherent component of the program.

- **Low-priority:** Increase the number of supplementary image examples provided for further explanations.

By implementing the high-priority adjustment into final launch of the design, the interactive comic could offer a more immersive, comprehensive, and dependable educational experience, aligning with the principles of interactive learning and user-centered design.

Implication: While some recommendations were deemed as low-priority for the current study, it is essential to take them into account when designing educational interactive comics. Some of these suggestions can be incorporated into the framework of the instruction with interactive comics. Embedding videos within educational interactive comics implies multimedia integration, enhancing the richness of the learning experience by combining visual and auditory elements to convey information effectively. Augmenting the quantity of interactive questions while transitioning from user-selected options to input requests presents an opportunity to deepen user engagement and foster greater interaction with the educational content. This shift towards increased interactivity aligns with contemporary pedagogical approaches, potentially resulting in heightened learner involvement and knowledge retention (Mayer, 2014).

Adding a sub-menu option to interactive comic's main menu, along with providing vocabulary lists to help with learning new words, has the potential to improve the understanding of the language. By offering structured navigation options and linguistic aids, educators can facilitate a more conducive learning environment, thereby potentially optimizing overall learning outcomes and experiences.

General Discussion: It is interesting to observe that even though the interactive comic version designed with using the same images, the participants in the interactive comic group chose not to give any feedback on the color schemes and backgrounds. This lack of commentary on these specific aspects raises questions about the participants' level of engagement with the visual elements of the comic. It may suggest that the participants were more focused on other aspects of the interactive comic, such as the storyline or interactive features, rather than the aesthetics of the images themselves. This could potentially suggests areas for future research direction and the design of educational interactive comics, highlighting the

importance of considering various elements that contribute to the overall user experience.

This observation further indicates the connection between the choice of colors and the overall layout of the panel design in teacher-made physical comics. In this specific instance, the implementation of a single-panel layout design appears to mitigate potential design flaws while a repetitive twelve-panel grid with four tiers of panels is hard to manage to maintain visual coherence and aesthetic unity. This can be interpreted as a design hint for teachers, who already shoulder a substantial burden of duties and obligations such as creating materials and developing course content, should carefully contemplate these specific details while making their own instructional comics. The layout of a comic can greatly impact how information is conveyed and understood by the reader. By strategically arranging panels, text, and images, teachers can enhance the overall reading experience for students. In contrast, a poorly designed layout can lead to confusion, disconnection, and a lack of engagement from the reader. Therefore, it is crucial for teachers to consider the layout design of their physical comics to effectively communicate their educational content and engage their audience. Instead of downloading ready-made layouts as PDFs, teacher-designers may download separate images and customize the layout by adjusting colors and other elements when using photo-mechanical comic book applications or web-based comics generators. Although it may require a substantial amount of time, it is worthwhile to consider this approach.

Engaging in a comprehensive study to compare the effectiveness of educational comics presented in various formats across diverse and distinct groups can yield significant and valuable insights into their impact on learning outcomes. By analyzing the results of experimental research practices, educators and stakeholders can gain a deeper understanding of how different formats of educational comics may influence student engagement, comprehension, and retention. This type of comparative research has the potential to inform decision-making in the development and implementation of educational materials, ultimately leading to more effective and tailored approaches to promoting learning through visual storytelling. When examining the learning experiences and user experiences in various educational comic formats, it is evident that simply categorizing the study into distinct groups, such as physical or interactive, may not adequately capture the complexity of the

topic. Different formats offer unique advantages and challenges that contribute to the overall learning experience. For example, physical comics provide a tangible and traditional reading experience, while interactive comics offer a more dynamic, inclusive, and engaging platform for users to interact with the content. By delving into the intricacies of each format, educators and researchers can enhance their inquiries by allowing both groups to partake in the experience of each format. This can lead to a more comprehensive understanding of how different formats can impact learning outcomes and student engagement. Additionally, by incorporating various formats into their teaching practices, educators can cater to different learning styles and preferences among students. Ultimately, exploring the nuances of each format can open up new possibilities for innovative teaching methods and meaningful research in the field of educational comics.

6. CONCLUSION

When we examine and compare the results of the study alongside other education comics research, we see that it was already known that digital comics have been effective in ESP classes. What remained unknown and added to the body of literature following our study is that the results obtained from the comparison of the impacts associated with the utilization and examination of the teacher-made physical and interactive comics tailored for English for design purposes in a non-English academic setting. Although the study had a limited sample size, it has uncovered shared conclusions regarding the utilization of teacher-made physical comic and interactive comic in an ESP setting as follows:

- Both teacher-made comics "Norm(s) of Design Language" and *NDL 1.0* have demonstrated equal effectiveness in the context of English for design purposes.
- Both comic formats have been favored for implementation in educational settings, albeit with supplementary instructional modifications by the instructor.
- Both comic formats have been deemed advantageous in the realm of design education.
- Both groups emphasized the importance of employing constructivist methodologies in design education.
- Both group participants indicated the lack of supplementary materials in design education.
-

By using targeted teacher-made multimodal intervention materials tailored to constructivist learning approaches, communication design students equally improved their reading skills and their field of knowledge. These improvements not only facilitate effective communication within the global design community but also enhance their ability to articulate design concepts, ideas, and critiques with clarity and precision. Study participants showed enhanced retention and recollection of design terminology after exposure to specialized vocabulary in a comic format. This aligns with the findings of Konhke's study (2021). The dialogic nature of comics facilitated participants' active engagement with the content; reinforcing their

memory of the design vocabulary and facilitating easier recall during subsequent encounters. Teacher-made comics provided participants with contextualized examples of professional terminology, demonstrating its use in specific situations or scenarios. By observing the contextualized language presented in a narrative setting, the participants acquired a more profound comprehension of the subtle connotations and uses of the terminology, transcending mere definitions. A majority of the participants emphasized that the conversational format of the comics exposed them to various linguistic structures and terminology commonly used in professional contexts, thereby enhancing their ability to communicate effectively in similar settings.

Despite differences in presentation, there is room for drawing conclusions about the importance of the aesthetic and hedonic quality of educational comics designed for adult learners. Smaragdina et al. (2019) developed an educational comic to use for informatics education at tertiary level. The educational comic was enhanced with augmented reality, allowing students to not only acquire knowledge through the comics but also engage in simulated 3D animations and interactive experiences using AR applications, thereby enhancing their comprehension. According to the UEQ results, it was determined that there is potential for improving the hedonic quality of the educational comic. The results demonstrate certain parallels with the findings of the teacher-made comic within the present study. Despite disparities in character design and stylistic approach between the study of Smaragdina et al. (2019) and the current physical comic, both studies underscore the significance of meticulous design considerations in educational comics tailored for adult learners.

Given the limited sample size of this study, the comparative findings suitable for informing future research discussions are delineated to elucidate the conclusions drawn from the mixed-method quasi-experimental phase as follows:

- While participants in the physical comic group felt isolated in self-reading of the-teacher-made comic, the interactive group did not feel isolated. The interactive comic was also found to be inclusive and much more personal than the physical comic.
- The interactive comic group correlated their learning experience more closely with pedagogical implications than the physical comic group.
- The physical comic differed in attractiveness and hedonic quality, despite using the same images for design.

- Despite the fact that the study did not employ any specific instrument to investigate the cognitive load of the teacher-made comics, some students in the physical comic group indicated that they were under a significant amount of mental strain. Further quantitative data from IMMS-SU was also utilized to ascertain this information. The cognitive load associated with studying a physical comic book was significantly different from the cognitive load associated with studying an interactive comic book. Additionally, the hedonic quality and Attractiveness have been identified as factors that act as mediators to alleviate the cognitive load that is associated with the physical comic reading experience.
- While the statistical analysis did not reveal a significant difference between the IMMS-SU and UEQ comparisons, the effect sizes pointed towards distinct trends. The qualitative data further validated these patterns. In conclusion, the interactive comic significantly improved user experience and highlighted a preference for motivational aspects.

The practical conclusions in terms of data collection instruments, design approaches and tools as follows:

- RCEP has been found to be effective and practical in unveiling the attitudes and perceptions of the participants towards the use of comics for educational purposes.
- UEQ and IMMS-SU have proven to be efficacious in the investigation of the user experience and learning experience. The tools corroborated each other's conclusions and highlighted identical aspects to be deliberated upon during the focus group deliberations.
- The utilization of the design thinking model from d.school, in conjunction with Keller's (2000) ten steps of motivational design, yielded swift and effective solutions in the creation of teacher-made comics. The implementation of the design thinking process did not impede the researcher's creative involvement during the development of educational comics.
- The utilization of comics generators for crafting physical educational comics tailored for adult learners necessitates meticulous attention to detail and further refinement in design.

The remainder of the chapter delves into the implications, provides a more in-depth analysis of the findings, addresses the constraints, and offers recommendations for future research endeavors.

Leveraging technology and digital resources offered interactive learning experiences that cater to diverse learning styles and preferences. The present study has demonstrated that interactive comics empower students to independently enhance their professional language and promptly receive feedback on their development, thereby increasing their confidence and reshaping their perception of success in

professional language. Furthermore, it has been shown that establishing a nurturing educational atmosphere that empowers students to embrace challenges, learn from errors, and benefit from feedback is crucial for nurturing linguistic proficiency and bolstering self-assurance in the realm of professional language acquisition. Overall, active engagement and supportive feedback mechanisms, along with a holistic approach that integrates language learning into design education within the framework of a design artifact, can effectively contribute to the continuous improvement of English proficiency among design students.

Future research endeavors could explore the longitudinal effects of incorporating multimodal artifacts into English for design education, tracking the sustained impact on students' professional language proficiency and design-related competencies over time. In addition to implementing interventions that focus on language skills, it is also important to explore the effectiveness of different teaching methods favoring socio-constructivist approaches like flipped classrooms and project-based learning in order to enhance professional language development of ESP design students.

Further research is highly recommended to delve deeper into the effects of interactive comics on ESP instruction for various contexts. The domain of English for design purposes still holds numerous unexplored learning and teaching approaches, strategies, and resources that merit further studies. Most notably, further investigation is required in the realm of other multimodal and interactive multimodal resources for English for design purposes research, which uphold constructivist learning and teaching approaches. By delving into research on these alternative materials, valuable insights can be obtained on how to most effectively enhance the learning experience for design students.

The findings of the present study also suggest that comics could play a role in both theoretical and applied design courses in tertiary-level design education. Its participants identified the integration of comics into professional design education and pedagogy as an area of interest. This also highlights the need of incorporating a wide range of multimodal resources into design pedagogy and constructivist approaches, which will ultimately facilitate a more nuanced understanding of the comics medium and the various applications it has in tertiary level design education.

It is imperative to acknowledge that the current thesis is not without its limitations. One such limitation pertains to the teacher's multifaceted role as a researcher. Although this fosters a strong link between research procedures and the classroom setting, it also has the potential to introduce biases or conflicting interests that might sway the analysis of data or the execution of interventions (Bergmark, 2020). Moreover, the unavoidable power dynamics inherent in the teacher-student interplay could influence the extent to which participants are willing to offer sincere feedback or actively participate in the research process (Lau & Stille, 2014). Nonetheless, our participants' genuine responses suggest that this concern is relatively insignificant for the present study.

The external validity of the findings poses an additional constraint on the current study. The limited sample size, confined to a particular demographic and geographic region, impedes the transferability of the results to a broader population or diverse fields. Moreover, the investigation centered exclusively on a specific array of variables; neglecting other plausible factors that may influence the outcomes being studied. Therefore, although the results hold significance within the confines of this present study, researchers are expected to exercise caution if extrapolating them to alternate settings, disciplines, and group of participants.

From a reflexive perspective, the study aims to highlight an additional aspect that should be taken into account when conducting similar experimental research in tertiary educational settings. During in-class observations, certain students reported test anxiety, despite the researcher's efforts to implement supplementary measures to alleviate stress. The researcher refrained from conducting individual interviews with these students due to time constraints. Given the researcher's dual role as both instructor and the individual carrying out the study, students who experienced test anxiety, along with others, expressed a sense of responsibility for not contributing positively to the study following the initial intervention. This situation may have added an extra layer of pressure and unease for these students, potentially worsening their anxiety. On this point, the researcher contemplated incorporating an inquiry regarding the multifaceted role of the instructor and its influence on the students. However, it was determined that delving into this aspect would have exceeded the confines of the current study and necessitate an exhaustive examination. Subsequent research endeavors may explore this subject matter in their investigations. Future

research endeavors, especially those aligned with similar goals, may greatly benefit from prioritizing direct interactions with these students.

In future research endeavors at the tertiary level, it is recommended that due consideration be given to the potential impact of this dual role on participant experiences and potential strategies to mitigate any undue stress or burden on students. As previously noted, the researcher employed envelopes and coding techniques to provide support and reassurance to students throughout the study. However, these approaches did not appear to yield significant results in the first week of the study. To avoid these outcomes, future researchers may consider conducting a pilot study prior to initiating the research.

It is crucial to note that this research did not utilize a case-study methodology. The researcher designated the research as experimental due to their direct manipulation and impact on the independent variable (Yin, 2018). ESP and design researchers are free to use "Norm(s) of Design Language" and *NDL 1.0*, to carry out case studies within their respective academic programs (see https://sites.google.com/view/design-sensei/ mentioned earlier in Chapter 3 for further information). By fostering a stronger sense of community, instructors of English for design can leverage the combined knowledge and dedication of a variety of participants to elevate the standard, reach, and endurance of share-alike materials in the field of English for design education. Through the collective efforts and contributions of a dedicated community, the impact and effectiveness of open-source initiatives in English for design education can be significantly amplified, leading to greater opportunities for growth in academic research, cultivating students' learning experiences, and education of global designers.

Finally, the current study delves into a contentious issue within the realm of educational comics research. The creation of comics by educators and researchers is gaining significance as a research area, prompting additional investigations into secondary studies. Nevertheless, this study reveals that the design elements of teacher or researcher-made comics have not been thoroughly explored in educational contexts. There is a dearth of information concerning design choices and components. To tackle this challenge, the present thesis suggests the utilization of a design document akin to those used in game design. Comic design documents may function as a means of communication for scholars, offering a unified structure for

the discussion and delineation of educational comics in subsequent scholarly pursuits. These documents have the potential to enhance transparency by elaborating on the methodology and protocols employed in comic design. This enables comics researchers to understand and evaluate peer research methodology and design choices; thus promoting the replication and further exploration of the results. Furthermore, this could constitute a significant advancement in the realm of comic studies as a whole, prompting researchers to hone in on the more distinctive elements of the medium with precision.

REFERENCES

Aggleton, J. (2018). *Defining digital comics: a British Library perspective*. Journal of Graphic Novels and Comics.

Ahad, N. A., Yin, T. S., Othman, A. R., & Yaacob, C. R. (2011). *Sensitivity of normality tests to non-normal data.* Sains Malaysiana, 40(6), 637-641.

Aleixo, P. A., & Sumner, K. (2017). *Memory for biopsychology material presented in comic book format.* Journal of Graphic Novels and Comics, 8(1), 79-88.

Allum, P. (2002). *CALL and the classroom: The case for comparative research.* ReCALL, 14(1), 146-166.

Alterio, M., & McDrury, J. (2003). *Learning Through Storytelling in Higher Education: Using Reflection and Experience to Improve Learning.* Routledge.

Anggrianto, C. (2022). *The Shifting Paradigm of Visual Communication Design Profession.* In International Conference on Sustainability in Creative Industries (pp. 175-183). Cham: Springer Nature Switzerland.

Apostolou, D., & Linardatos, G. (2023). *Cognitive load approach to digital comics creation: A student-centered learning case.* Applied Sciences, 13(13), 7896.

Applefield, J. M., Huber, R., & Moallem, M. (2000). *Constructivism in theory and practice: Toward a better understanding*. The High School Journal, 84(2), 35-53.

Arbuthnot, M. H. (1947). *Children and the comics.* Elementary English, 24(3), 171-183.

Arias, E., Eden, H., Fischer, G., Gorman, A., & Scharff, E. (2000). *Transcending the individual human mind—creating shared understanding through collaborative design.* ACM Transactions on Computer-Human Interaction (TOCHI), 7(1), 84-113.

Archer, A., & Newfield, D. (2014). Challenges and opportunities of multimodal approaches to education in South Africa. *Multimodal approaches to research and pedagogy*, 1-16.

Archer, A., & Breuer, E. (2016). *A multimodal response to changing communication landscapes in higher education*. In Multimodality in Higher Education (pp. 1-17). Brill.

Arlin, M., & Roth, G. (1978). *Pupils' use of time while reading comics and books.* American Educational Research Journal, 15(2), 201-216.

Armstrong, J. S., & Patnaik, S. (2009). *Using quasi-experimental data to develop empirical generalizations for persuasive advertising.* Journal of Advertising Research, 49(2), 170-175.

Azman, F. N., Zaibon, S. B. & Shiratuddin, N. (2014) *Exploring digital comics as an edutainment tool: An overview.* In: Knowledge Management International Conference 2014 (KMICe2014), 12-15 August 2014, Langkawi, Malaysia.

Backe, H. J. (2019). *Game-Comics and Comic-Games–Against the Concept of Hybrids.* Tekstualia, 3(58), 71-92.

Bacon, S. M., & Finnemann, M. D. (1990). *A study of the attitudes, motives, and strategies of university foreign language students and their disposition to authentic oral and written input.* The Modern Language Journal, 74(4), 459-473.

Bada, S. O., & Olusegun, S. (2015). *Constructivism learning theory: A paradigm for teaching and learning.* Journal of Research & Method in Education, 5(6), 66-70.

Bai, L., & Kalaj, D. (2021). *Approximation of Kolmogorov–Smirnov test statistic.* Stochastics, 93(7), 993-1027.

Barber, C. L. (1962). *Some measurable characteristics of modern scientific prose.* Contributions to English syntax and philology, 2, 21-43.

Barbour, J. B., Jensen, J. T., & Call, S. R. (2023). *Organizational communication design.* The De Gruyter handbook of organizational communication theory and research. De Gruyter. Prepublished.

Barnes, D. (1976) *From communication to curriculum*. Harmondsworth: Penguin Books.

Barnes, D. and Todd, F. (1977) *Communication and Learning in Small Groups*. London: Routledge & Kegan Paul.

Barrows, H. S. (1986). *A taxonomy of problem-based learning methods.* Medical Education, 20(6), 481-486.

Barut Tugtekin, E., & Dursun, O. O. (2022). *Effect of animated and interactive video variations on learners' motivation in distance Education.* Education and Information Technologies, 27(3), 3247-3276.

Basturkmen, H. (2010). *Developing courses in English for specific purposes*. Basingstoke, UK: Palgrave

Basturkmen, H. (2019). *ESP teacher education needs.* Language Teaching, 52(3), 318-330.

Bateman, J. (2008). *Multimodality and genre: A foundation for the systematic analysis of multimodal documents*. Springer.

Bazerman, C. (1988). *Shaping written knowledge: The genre and activity of the experimental article in science* (Vol. 356). Madison: University of Wisconsin Press.

Bergmark, U. (2019). *Rethinking researcher–teacher roles and relationships in educational action research through the use of Nel Noddings' ethics of care.* Educational Action Research, 28(3), 331-344.

Bezemer, J., & Kress, G. (2008). *Writing in multimodal texts: A social semiotic account of designs for learning.* Written communication, 25(2), 166-195.

Bezemer, J., & Kress, G. (2015). *Multimodality, learning and communication: A social semiotic frame.* Routledge.

Bonk, C. J., & Cunningham, D. J. (2012). Searching for learner-centered, constructivist, and sociocultural components of collaborative educational learning tools. In *Electronic collaborators* (pp. 25-50). Routledge.

Bonsignori, V. (2018). *Using films and TV series for ESP teaching: A multimodal perspective*. System, 77, 58-69.

Boyatzis, R. E. (1998). *Transforming qualitative information: Thematic analysis and code development.* Sage.

Braun, V., & Clarke, V. (2006). *Using thematic analysis in psychology*. Qualitative research in psychology, 3(2), 77-101.

Braun, V., Clarke, V. (2012) Thematic analysis. In: Cooper, H., Camic, P.M., Long, D.L., Panter, A.T., Rindskopf, D., Sher, K.J. (Eds.) *APA Handbook of Research Methods in Psychology, Research Designs*, vol. 2, pp. 57–71. American Psychological Association, Washington.

Clarke, V., & Braun, V. (2017). *Thematic analysis.* The journal of positive psychology, 12(3), 297-298.

Braun, V., Clarke, V. (2019) Reflecting on reflexive thematic analysis. Qual. Res. Sport Exerc. Health 11(4), 589–597.

Braun, V., & Clarke, V. (2021). *One size fits all? What counts as quality practice in (reflexive) thematic analysis?*. Qualitative research in psychology, 18(3), 328-352.

Breen, M.P. (1985). *Authenticity in the language classroom*. Applied Linguistics, 6, 60-70.

Brisco, R., Whitfield, R. I., Grierson, H., & Bohemia, E. (2019). *Overcoming the challenges of global collaboration through design education.* In DS 95: Proceedings of the 21st International Conference on Engineering and Product Design Education (E&PDE 2019), University of Strathclyde, Glasgow. 12th-13th September 2019.

Brodén, D. (2024). *Refiguring comic book imagery in a post-digital moment: conspicuousness, hybridity and ontological strangeness.* Journal of Graphic Novels and Comics, 1-13.

Brown, J. W. (1977). *Comics in the foreign language classroom: Pedagogical perspectives*. Foreign Language Annals, 10(1), 18-25.

Brown, J. A. (1997). *Comic book fandom and cultural capital.* Journal of Popular Culture, 30(4), 13.

Brown, H. D. 1994. *Teaching by principles: An interactive approach to language pedagogy.* Upper Saddle River, NJ: Prentice Hall Regents.

Carlgren, L., Rauth, I., & Elmquist, M. (2016). *Framing design thinking: The concept in idea and enactment.* Creativity and innovation management, 25(1), 38-57.

Carter, J. B. (2007). *Transforming English with Graphic Novels: Moving toward Our "Optimus Prime"*. English Journal, 49-53.

Carver, D. (1983). *Some propositions about ESP*. The ESP journal, 2(2), 131-137.

Cary, S. (2004). *Going graphic: Comics at work in the multilingual classroom* (Vol. 102). Portsmouth, NH: Heinemann.

Cazden, C., Cope, B., Fairclough, N., Gee, J., Kalantzis, M., Kress, G., ... & Nakata, M. (1996). *A pedagogy of multiliteracies: Designing social futures*. Harvard educational review, 66(1), 60-92.

Chaikovska, O. (2018). *Benefits of teaching ESL through comic strips*. Web of Scholar, 4(1), 8-11.

Cheng, A. (2005). *Genre and learning: Exploring learners and learning in the ESP genre-based framework of learning academic writing.* The Pennsylvania State University.

Cheng, A. (2006). *Understanding learners and learning in ESP genre-based writing instruction.* English for specific purposes, 25(1), 76-89.

Chilcoat, G. W. (1993). *Teaching about the civil rights movement by using student-generated comic books*. The Social Studies, 84(3), 113-118.

Chilcoat, G. W., & Ligon, J. A. (1994). *Developing democratic citizens: The Mississippi Freedom Schools as a model for social studies instruction.* Theory & Research in Social Education, 22(2), 128-175.

Clark, E. E. (2017). *Are comics effective materials for teaching ELLS? A literature review on graphic media for L2 instruction*. IJAEDU-International E-Journal of Advances in Education, 3(8), 298-309.

Cope, B., & Kalantzis, M. (Eds.). (2000). *Multiliteracies: Literacy learning and the design of social futures.* Psychology Press.

Copley, J. (1992). The integration of teacher education and technology: a constructivist model. In D. Carey, R. Carey, D. Willis, & J. Willis (Eds.), *Technology and Teacher Educatio*n, Charlottesville, VA: AACE, 681.

Crăciun, D., & Bunoiu, M. (2019). *Digital comics, a visual method for reinvigorating Romanian science education.* Romanian Journal for Multidimensional Education/Revista Romaneasca Pentru Educatie Multidimensionala, 11(4).

Cruz Rondón, E. J., & Velasco Vera, L. F. (2016). *Understanding the role of teaching materials in a beginners' level English as a foreign language course: A case study. Profile Issues in TeachersProfessional Development*, 18(2), 125-137.

Cobb, P. (1994). *Where is the mind? Constructivist and sociocultural perspectives on mathematical development.* Educational researcher, 23(7), 13-20.

Cohn, N. (2007). *The visual language manifesto: Restructuring the 'Comics' Industry and Its Ideology*. Visual Language Lab.

Cohn, N. (2013a). *The Visual Language of Comics: Introduction to the Structure and Cognition of Sequential Images*. A&C Black.

Cohn, N. (2013b). *Navigating comics: An empirical and theoretical approach to strategies of reading comic page layouts.* Frontiers in psychology, 4, 46474.

Cohn, N. (2014). *The architecture of visual narrative comprehension: The interaction of narrative structure and page layout in understanding comics.* Frontiers in Psychology, 5, 91804.

Cohn, N. (Ed.). (2016a). *The visual narrative reader*. Bloomsbury Publishing.

Cohn, N. (2016b). From Visual Narrative Grammar to Filmic Narrative Grammar: The narrative structure of static and moving images. In *Film Text Analysis* (pp. 94-117). Routledge.

Cohn, N. (2020). *Your brain on comics: A cognitive model of visual narrative comprehension.* Topics in cognitive science, 12(1), 352-386.

Copley, J.V. (1992). *The integration of teacher education and technology: A constructivist model.* In D. Carey, R. Carey, D. Willis, & J. Willis (Eds.), Technology and Teacher Education Annual 1991. (pp. 617-622). Charlottesville, VA: Association for the Advancement of Computing in Education.

Corder, G. W., & Foreman, D. I. (2014). *Nonparametric statistics: A step-by-step approach.* John Wiley & Sons.

Cortina, J. M. (1993). *What is coefficient alpha? An examination of theory and applications.* Journal of applied psychology, 78(1), 98.

Crăciun, D., & Bunoiu, M. (2019). *Digital comics, a visual method for reinvigorating Romanian science education.* Romanian Journal for Multidimensional Education/Revista Romaneasca Pentru Educatie Multidimensionala, 11(4).

Creswell, J. W. (1999). *Mixed-method research: Introduction and application. In Handbook of educational policy* (pp. 455-472). Academic press.

Creswell, J. W., Clark, V. L. P., Gutmann, M. L., & Hanson, W. E. (2003). *Advanced mixed. Handbook of mixed methods in social & behavioral research*, Sage.

Creswell, J. W., & Creswell, J. D. (2005). *Mixed methods research: Developments, debates, and dilemma* (pp. 315-326). Oakland, CA: Berrett-Koehler Publishers.

Danzak, R. L. (2011). *Defining identities through multiliteracies: EL teens narrate their immigration experiences as graphic stories.* Journal of Adolescent & Adult Literacy, 55(3), 187-196.

Darnhofer, I. (2018). *Using comic-style posters for engaging participants and for promoting researcher reflexivity.* International Journal of Qualitative Methods, 17(1), 1609406918804716.

Dearden, J., Macaro, E., & Akincioglu, M. (2016). *English medium instruction in universities: A collaborative experiment in Turkey.* Studies in English Language Teaching, 4(1).

Delacre, M., Lakens, D., & Leys, C. (2017). *Why psychologists should by default use Welch's t-test instead of Student's t-test.* International Review of Social Psychology, 30(1), 92-101.

Dittmar, J. (2012). *Digital comics*. SJoCA Scandinavian Journal of Comic Art, 1(2), 82-91.

Dittmar, J. F. (2015). *Experiments in comics storytelling.* Studies in Comics, 6(1), 157-165.

Dobrowolski, A. (1976). *The comic book is alive and well and living in the history class.* The Social Studies, 67(3), 118-120.

Dudley-Evans, T. (1998). *An Overview of ESP in the 1990s.* Simplification (Language), 5.

Dudley-Evans, A. & St. John, A. M. (1998). *Developments in ESP: A multi-disciplinary approach.* Cambridge: Cambridge University Press.

Dudley-Evans, T. (2000). *Genre analysis: a key to a theory of ESP?*. Ibérica, Revista de la Asociación Europea de Lenguas para Fines Específicos, (2), 3-11.

Dunst, A., Laubrock, J., & Wildfeuer, J. (2018). Empirical Comics Research. Digital, Multimodal, and Cognitive Methods. London and New York: Routledge.

Duffy, T. M. & Cunningham, D. J.(n.d.) *Constructivism: Implications for the design and delivery of instruction.* Foundations for Research in Educational Communications and Technology

Dunst, A., Laubrock, J., & Wildfeuer, J. (2018). *Empirical Comics Research: Digital, multimodal, and cognitive Methods.* London and New York: Routledge.

Dyson, A. H. (1997). *Writing superheroes: Contemporary childhood, popular culture, and classroom literacy*. Teachers College Press.

Eisner, W. (1985). *Comics and sequential art: Principles and practice of the world's most popular art form*. Cincinnati, OH: North Light Books.

Eisner, Will. (1996). *Graphic Storytelling & Visual Narrative*. Tamarac, FL: Poorhouse Press.

Eliopoulos, G. M., Shardell, M., Harris, A. D., El-Kamary, S. S., Furuno, J. P., Miller, R. R., & Perencevich, E. N. (2007). *Statistical analysis and application of quasi experiments to antimicrobial resistance intervention studies.* Clinical Infectious Diseases, 45(7), 901-907.

Engler, S., Hoskins, C., & Payne, S. (2008). *Computer-Produced Comics as a Means of Summarising Academic Readings in EAP Programs.* International Journal of Pedagogies & Learning, 4(4), 19.

Ertan, E. (2013). *Brief history of new media art in Turkey*. Rozenberg Quarterly.

Evans, V., Dooley, J., Rogers, H. P. (2013). *Career Paths: Art & Design*.& Publishing, E.

Fadavi, M., & Ershadi, A. R. (2014). *Evaluating the position of ESP for art students in University of Tehran Art Schools.* Journal of novel applied sciences, 3(10), 1151-1162.

Febriani, M., Prasandha, D., Utami, S. P. T., Setyaningsih, N. H., Yuniawan, T., & Sugiarto, E. (2021, March). *The online comic development of Indonesian Folklore as a literature learning media for millennials*. In IOP Conference Series: Materials Science and Engineering (Vol. 1098, No. 3, p. 032015). IOP Publishing.

Fedorenko, S., Voloshchuk, I., Sharanova, Y., Glinka, N., & Zhurba, K. (2021). *Multimodality and digital narrative in teaching a foreign language.* Arab World English Journal (AWEJ) Special Issue on CALL, (7).

Ferdiawan, I. K. T., Ratminingsih, N. M., & Adnyani, L. D. S. (2021). *Graphic novel development as a reading media for increasing literacy skill of 8th grade junior high school students.* The Art of Teaching English as a Foreign Language, 2(2), 169-182.

Field, A. (2017). *Discovering Statistics Using IBM SPSS Statistics* (5th ed.). SAGE Publications.

Fosnot, C. T. (2013). *Constructivism: Theory, perspectives, and practice.* Teachers College Press.

Freedman, A. (2011). *Comics, graphic novels, graphic narrative: A review*. Literature Compass, 8(1), 28-46.

Gangnes, M. B., Murray, C., & Round, J. (Eds.). (2024). *Multimodal Comics: The Evolution of Comics Studies*. Intellect Books.

Garson, G. D. (2012). *Testing Statistical Assumptions*. Statistical Associates Publishing.

Gebhard, J.G. (1996). *Teaching English as a Foreign Language: A Teacher Self-Development and Methodology Guide*. Ann Arbor: The University of Michigan Press

Gelernter, M. (1995). *Sources of architectural form: a critical history of Western design theory*. Manchester University Press.

George, D., & Mallery, P. (2003). *SPSS for Windows step by step: A simple guide and reference.* 11.0 update—Fourth edition. Boston: Allyn & Bacon.

Gerstein, M., & Friedman, H. H. (2016). *Rethinking higher education: Focusing on skills and competencies.* Psychosociological Issues in Human Resource Management, 4(2), 104.

Getto, G., Potts, L., Salvo, M. J., & Gossett, K. (2013). *Teaching UX: Designing programs to train the next generation of UX experts.* In Proceedings of the 31st ACM international conference on Design of communication (pp. 65-70).

Giannakos, M., & Cukurova, M. (2023). *The role of learning theory in multimodal learning analytics.* British Journal of Educational Technology, 54(5), 1246-1267.

Gilakjani, A. P., Ismail, H. N., & Ahmadi, S. M. (2011). *The effect of multimodal learning models on language teaching and learning.* Theory & Practice in Language Studies, 1(10).

Gilmore, S. P. (2013). *The invention of the graphic novel: Underground comix and corporate aesthetics.*(Publication no3614589). [Doctoral Dissertation, University of Illinois].PQDT Open. https://www.proquest.com/openview/c5b42a3aa562632c7f16c60f23ae69a9/1?pq-origsite=gscholar&cbl=18750

Gilmore, J. N., In (Eds.). Gilmore J, N & Matthias Stork (2014). *Superhero synergies: Comic book characters go digital.* Rowmann & Littlefield.

Gliem, J. A., & Gliem, R. R. (2003). C*alculating, interpreting, and reporting Cronbach's alpha reliability coefficient for Likert-type scales.* In Midwest research-to-practice conference in adult, continuing, and community education (Vol. 1, pp. 82-87).

Goodbrey, D. M. (2013). *Digital comics–new tools and tropes*. Studies in Comics, 4(1), 185-197.

Goodbrey, D. M. (2014). *Game comics: an analysis of an emergent hybrid form.* Journal of Graphic Novels and Comics, 6(1), 3-14.

Grapin, S. (2019). Multimodality in the new content standards era: Implications for English learners. Tesol Quarterly, 53(1), 30-55.

Greco, L. M., O'Boyle, E. H., Cockburn, B. S., & Yuan, Z. (2018). *Meta-analysis of coefficient alpha: A reliability generalization study.* Journal of Management Studies, 55(4), 583-618.

Green, S. B. (2003). A coefficient alpha for test-retest data. Psychological Methods, 8(1), 8.

Greene, J. C. (2007). *Mixed methods in social inquiry* (Vol. 9). John Wiley & Sons.

Graham, R. (2016). Comics in libraries. In *The Routledge Companion to Comic*s (pp. 399-405). Routledge.

Graham, S. (2011). *Comics in the classroom: Something to be taken seriously.* Language Education in Asia, 2(1), 92-102.

Gray, A. J. (1997). *Constructivist teaching and learning* (pp. 97-07). Regina, SK, Canada: Saskatchewan School Trustees Association.

Groensteen, T. (2007). *The system of comics*. Univ. Press of Mississippi.

Groensteen, T. (2013). *Comics and narration.* Univ. Press of Mississippi.

Gunasekara, P. P., Perera, P. M., Adhihetty, C. D., Kollure, D. D., Kodagoda, N., & Caldera, A. (2024, May). *Generate Comic Strips Using AI.* In Proceedings of Conference on Transdisciplinary Research in Engineering (Vol. 1, No. 1).

Halliday, M. A. (1978). *Ideas about language.* Arts: The Journal of the Sydney University Arts Association, 11.

Hanusz, Z., & Tarasińska, J. (2015). *Normalization of the Kolmogorov–Smirnov and Shapiro–Wilk tests of normality.* Biometrical Letters, 52(2), 85-93.

Hapsari, A. N., Risdianto, E., & Medriati, R. (2022). *Analysis of needs response to the development of digital comic on straight motion kinematics materials.* IJOEM Indonesian Journal of E-learning and Multimedia, 1(2), 42-51.

Harris, K. R., & Alexander, P. A. (1998). *Integrated, constructivist education: Challenge and reality.* Educational Psychology Review, 10(2), 115-127.

Heer, J., & Worcester, K. (Eds.). (2009). *A Comics Studies Reader*. Univ. Press of Mississippi.

Henderson, J. K., & Louhiala-Salminen, L. (2011). D*oes language affect trust in global professional contexts? Perceptions of international business professionals.* Journal of Rhetoric, Professional Communication, and Globalization, 2(1), 2.

Hernández, M. A., & Bautista, P. S. (2023). *The Renewal of the Webcomic in the Era of Platformization: The Case of 9Gag on Instagram*. Social Media+ Society, 9(4), 20563051231203675.

Hobart, J. C., Cano, S. J., Warner, T. T., & Thompson, A. J. (2012). *What sample sizes for reliability and validity studies in neurology?*. Journal of neurology, 259, 2681-2694.

Hodge, R. I. V., & Kress, G. R. (1988). *Social semiotics*. Cornell University Press.

Hoekstra, R., Kiers, H. A., & Johnson, A. (2012). *Are assumptions of well-known statistical techniques checked, and why (not)?*. Frontiers in psychology, 3, 137.

Huancayo, V. R. G. (2021). *Use of comics for teaching Medical English Purpose*. Technium Soc. Sci. J., 23, 212.

Incelli, E. (2023). *A multimodal corpus approach to understanding parliamentary debates: the role of gesture and institutional discourse*. Annali del Dipartimento di metodi e modelli per l'economia, il territorio e la finanza, 1-17.

Ismagilova, L. R., & Polyakova, O. V. (2014). *The problem of the syllabus design within the competence approach based on the course "English for Master Degree Students in Economics (advanced level)"*. Procedia-Social and Behavioral Sciences, 152, 1095-1100.

Jacob, S. A., & Ferguson, S. P. (2012). *Writing interview protocols and conducting interviews: Tips for students new to the field of qualitative research.* The Qualitative Report, 17(42), 1-10.

Jacobs, D. (2007). *Beyond visual rhetoric: Multimodal rhetoric and newspaper comic strips*. International Journal of Comic Art, 9(1), 502.

Jacobs, D. (2014). *Webcomics, multimodality, and information literacy.* ImageTexT: Interdisciplinary Comics Studies, 7(3).

Jewitt, C. (2012). *Technology, literacy, learning: A multimodal approach*. Routledge.

Johns, A. M. (2012). The history of English for specific purposes research., In Paltridge, B., & Starfield, S. (Eds.). *The handbook of English for specific purposes*., (pp.5-30). Boston: Wiley-blackwell.

Jones, E. (2010). *The use of comic book style reading material in an EFL extensive reading program: A look at the changes in attitude and motivation to read in English in a Japanese university.* Language Education in Asia, 1(1), 228-241.

Johnson, D. W., Johnson, R. T., & Smith, K. A. (1998). *Cooperative learning returns to college what evidence is there that it works?*. Change: the magazine of higher learning, 30(4), 26-35.

Johnson, R. B., & Onwuegbuzie, A. J. (2004). *Mixed methods research: A research paradigm whose time has come.* Educational researcher, 33(7), 14-26.

Jonassen, D. H., & Rohrer-Murphy, L. (1999). *Activity theory as a framework for designing constructivist learning environments.* Educational technology research and development, 47(1), 61-79.

Jupp, V. (2006). *The Sage dictionary of social research methods.* The SAGE Dictionary of Social Research Methods, 1-352.

Hall, A., & Cheng, S. (2018). *Designing globalisation design.* In DS 93: Proceedings of the 20th International Conference on Engineering and Product Design Education (E&PDE 2018), Dyson School of Engineering, Imperial College, London. 6th-7th September 2018 (pp. 476-481).

Harvey, R. C. (1979). *The aesthetics of the comic strip.* Journal of Popular Culture, 12(4), 640.

Harvey, R. C. (1994). *The art of the funnies: An aesthetic history*. Univ. Press of Mississippi.

Harvey, R. C. (2009). How comics came to be: through the juncture of word and image from magazine gag cartoons to newspaper strips, tools for critical appreciation plus rare seldom witnessed historical facts. In Harvey, R. C., Heer, J., & Worcester, K. (Eds). *A comics studies reader*, 25-45.

Hoffman, R. (2018). *Comics in the omani EFL classroom: Boosting student vocabulary, reading, and motivation.* English education in Oman: Current scenarios and future trajectories, 281-297.

Hung, S. T. (2011). *Pedagogical applications of Vlogs: An investigation into ESP learners' perceptions.* British Journal of Educational Technology, 42(5), 736-746.

Hutchinson, Katharine H. (1949). *An Experiment in the Use of Comics as Instructional Material.*"Journal of Educational Sociology, 23: 236 - 245.

Jones, E. (2010). *The use of comic book style reading material in an EFL extensive reading program: A look at the changes in attitude and motivation to read in English in a Japanese university.* Language Education in Asia, 1(1), 228-241.

Kagan, S. (1989). *The structural approach to cooperative learning*. Educational leadership, 47(4), 12-15.

Kalina, C., & Powell, K. C. (2009). *Cognitive and social constructivism: Developing tools for an effective classroom.* Education, 130(2), 241-250.

Karimnia, A., & Jafari, F. M. (2017). *Critical ESP textbook evaluation: The case of visual arts textbook.* Sustainable Multilingualism, 11(1), 219-236.

Kartika, G. Azhar., & Nasir, M. (2023). *Development of e-comic as a physics learning media for class x students on momentum and impulse materials.* Jurnal Penelitian Pendidikan IPA, 9(1), 332-336.

Kavak, O., & İlhan, G. O. (2021). S*osyal bilgiler dersi etkin vatandaşlık öğrenme alanına yönelik dijital çizgi roman tasarımı:"Minik Vatandaşlar".* Öğretmen Eğitiminde Yenilikçi Araştırmalar Dergisi, 2(3), 243-265.

Kazar, S. G. (2013). *A needs analysis study in terms of the perceptions of the studentslearning and target needs at an ESP program: A case study* (Master's thesis, Eğitim Bilimleri Enstitüsü).

Khaghaninejad, M.S. (2016). *English for the Students of Art*. Publisher: Shiraz University Press.

Kilickaya, F. (2004). A*uthentic materials and cultural content in EFL classrooms*. Online Submission, Internet TESL Journal, 10(7).

Kim, S. (2018). *Exploring media literacy: Enhancing English oral proficiency and autonomy using media technology*. Studies in English Education, 23(2). https://doi.org/10.22275/see.23.2.03

Kirtley, C., Murray, C., Vaughan, P. B., & Tatler, B. W. (2023). *Navigating the narrative: An eye-tracking study of readers' strategies when Reading comic page layouts.* Applied Cognitive Psychology, 37(1), 52-70.

Kivunja, C., & Kuyini, A. B. (2017). *Understanding and applying research paradigms in educational contexts*. International Journal of higher education, 6(5), 26-41.

Koenke, K. (1981). ERIC/RCS: *The careful use of comic books.* The Reading Teacher, 34(5), 592-595.

Kohnke, L. (2018). *Using comic strips to stimulate student creativity in language learning.* Tesol Journal, 10(2), 1-5.

Kohnke, L. (2021). *L2 learners' perceptions of a comic strip in an ESP classroom.* The Asian ESP Journal, 17(5), 44-64.

Kohnke, L., & Ting, A. (2021). *ESL Students' perceptions of mobile applications for discipline-specific vocabulary acquisition for academic purposes.* Knowledge Management & E-Learning, 13(1), 102-117.

Kohnke, L., Jarvis, A., & Ting, A. (2021). *Digital multimodal composing as authentic assessment in discipline-specific English courses: Insights from ESP learners.* Tesol Journal, 12(3), e600.

Kolodner, J. (1993). *Case-Based reasoning.* San Mateo CA: Morgan Kaufmann.

Kolodner, J. L. (1997). Educational implications of analogy: A view from case-based reasoning. American psychologist, 52(1), 57.

Kraft, M. A. (2020). *Interpreting effect sizes of education interventions.* Educational researcher, 49(4), 241-253.

Kress, G. (2000). Multimodality. In A. Apple (Ed.), *Multiliteracies: Literacy learning and the design of social futures* (pp. 182–202). London, England: Routledge.

Kress, G., & van Leeuwen, T. (2001). *Multimodal discourse: The modes and media of contemporary communication*. London, England: Edward Arnold.

Kress, G. (2003) *Literacy in the New Media Age.* London: Routledge.

Kress, G. (2010). *Multimodality: A social semiotic approach to contemporary communication*. Routledge.

Kukkonen, K. (2013). *Contemporary comics storytelling*. U of Nebraska Press.

Kumar, R., & Dhar, D. (2023). *A think-aloud study: Exploring the effects of digital vs. print comics on reading efficiency and comprehension.* Education and Information Technologies, 1-24.

Kummin, S., Surat, S., Kutty, F. M., Othman, Z., & Muslim, N. (2020). *The use of multimodal texts in teaching English language oral skills.* Universal Journal of Educational Research, 8(12), 7015-7021.

Kundu, M. G., Mishra, S., & Khare, D. (2011). *Specificity and sensitivity of normality tests.* In Proceedings of VI International Symposium on Optimisation and Statistics. Anamaya Publisher.

Kural, F. (2019). *Evaluating Fine Arts Students' Attitudes towards Ongoing ESP Programs.* Cukurova University Faculty of Education Journal, 48(1), 275-304.

Куліш, І. М., & Королюк, Г. О. (2013). *English for Fine Arts Students.* навч. посіб. для студ. спеціальності «Образотворче мистецтво».

Kurt, S. (2019). *Sosyal bilgiler öğretiminde çizgi roman kullanımına ilişkin sosyal bilgiler öğretmen adaylarının görüşlerinin incelenmesi.*[Master Thesis, İstanbul Üniversitesi, Cerrahpaşa Lisansüstü Eğitim Enstitüsü, İstanbul).

Kusrini, D., Dewanty, V. L., & Hidayat, N. N. (2020, December). *The development of comics as a media to improve Japanese writing skill.* In 4th International Conference on Language, Literature, Culture, and Education (ICOLLITE 2020) (pp. 155-163). Atlantis Press.

Kuttner, P. J., Sousanis, N., & Weaver-Hightower, M. B. (2017). *How to draw comics the scholarly way*. Handbook of arts-based research, 396-422.

Laffier, J., & Luchka, L. (2021, March). *Supporting 21st century student learning and well-being with comics: A review of the literature.* In Society for Information Technology & Teacher Education International Conference (pp. 1269-1275). Association for the Advancement of Computing in Education (AACE).

Lapidus, A. (2023). *The Formulaic Nature of Comics: Language Learning and Multimodal Texts.* BRU ELT Journal, 1(3), 80-87.

Lau, S. M. C., & Stille, S. (2014). *Participatory research with teachers: Toward a pragmatic and dynamic view of equity and parity in research relationships.* European Journal of Teacher Education, 37(2), 156-170.

Lauer, C. (2009). C*ontending with terms:"Multimodal" and "multimedia" in the academic and public spheres.* Computers and composition, 26(4), 225-239.

Laugwitz, B.; Schrepp, M. & Held, T. (2006). *Konstruktion eines Fragebogens zur Messung der User Experience von Softwareprodukten.* In: A.M. Heinecke & H. Paul (Eds.): Mensch & Computer 2006 – Mensch und Computer im Strukturwandel. Oldenbourg Verlag, pp. 125 – 134. DOI: 10.1524/9783486841749.125.

Laugwitz, B., Held, T., & Schrepp, M. (2008). *Construction and Evaluation of a User Experience Questionnaire.* In HCI and Usability for Education and Work: 4th Symposium of the Workgroup Human-Computer Interaction and Usability Engineering of the Austrian Computer Society, USAB 2008, Graz, Austria, November 20-21, 2008, Proceedings (Vol. 5298, p. 63). Springer Science & Business Media.

Lee, J. H., Ostwald, M. J., Gu, N., & Roberts, M. (2021). *Linguistic and cultural perspectives on globalised design education.* International Journal of Technology and Design Education, 31(1), 165-181.

Lemke, J. L. (1998). Metamedia literacy: Transforming meanings and media. *Handbook of literacy and technology: Transformations in a post-typographic world*, 283301.

Lesiak-Bielawska, E. D. (2015). *Key aspects of ESP materials selection and design.* English for Specific Purposes World, 46(46), 1-26.

Lesmono, A. D., Bachtiar, R. W., Maryani, M., & Muzdalifah, A. (2018). T*he instructional-based andro-web comics on work and energy topic for senior high school students.* Jurnal Pendidikan IPA Indonesia, 7(2), 147-153.

Levene, H. (1960). Robust tests for equality of variances. *Contributions to probability and statistics.*Stanford University Press

Listianingsih, M., Astuti, I. A. D., Dasmo, D., & Bhakti, Y. B. (2021). *Android-based comics: An alternative media to improve scientific literacy.* Jurnal Penelitian dan Pembelajaran IPA, 7(1), 105-117.

Lewis III, D. R., & Lewis, T. Y. (2021). *A multimodal approach to higher order literacy development of low-level EFL university students in Japan.* Innovation in Language Learning and Teaching, 15(4), 364-383.

Li, M. (2020). *Multimodal pedagogy in TESOL teacher education: Students' perspectives.* System, 94, 102337.

Liu, J. (2004). *Effects of comic strips on L2 learners' reading comprehension.* TESOL quarterly, 38(2), 225-243.

Lotherington, H., & Jenson, J. (2011). *Teaching multimodal and digital literacy in L2 settings: New literacies, new basics, new pedagogies*. Annual review of applied linguistics, 31, 226-246.

Lubina, B. L., Kulenović, B. K., & Lumezi, M. L. (2015). *Creating a business English course book for academic needs: Challenges and solutions.* In 17th EBES Conference–Venice Proceeding CD Volume, Venecija, Italija (pp. 1195-1210).

Lutsky, L. A. (1990). *An empirical comparison of the robustness and power of the student's t Test, the Welch Test, and the Mann-Whitney U Test.*Hofstra University ProQuest Dissertations Publishing.

Mallia, G. (2007). *Learning from the sequence: The use of comics in instruction.* Interdisciplinary Comics Studies, 3 (3).

Mamolo, L. A. (2022). *Students' evaluation and learning experience on the utilization of Digital Interactive Math Comics (DIMaC) mobile app.* Advances in Mobile Learning Educational Research, 2(2), 375-388.

Mandasari, M., Kosassy, S. O., & Jufri, Y. (2022). *Incorporating of social media in distance learning: a case study on how tiktok improve speaking skill among esp students.* In International Conference on Government Education Management and Tourism (Vol. 1, No. 1, pp. 1-7).

Mann, H. B., & Whitney, D. R. (1947). *On a test of whether one of two random variables is stochastically larger than the other.* The annals of mathematical statistics, 50-60.

Mar, R. A., & Oatley, K. (2008). *The function of fiction is the abstraction and simulation of social experience*. Perspectives on psychological science, 3(3), 173-192.

Maria, M., Armaini, R., Noviyanti, L., & Dwitayanti, Y. (2022). *Accounting comics as a medium of learning.* In 5th FIRST T3 2021 International Conference (FIRST-T3 2021) (pp. 91-96). Atlantis Press.

Massey, F. J. Jr. (1951). *"The Kolmogorov-Smirnov Test for Goodness of Fit"*. Journal of the American Statistical Association. 46 (253): 68–78. doi:10.1080/01621459.1951.10500769.

Matthews, W. J. (2003). *Constructivism in the classroom: Epistemology, history, and empirical evidence.* Teacher Education Quarterly, 30(3), 51-64.

Mayer, R. E. (Ed.). (2014). *The Cambridge Handbook of Multimedia Learning.* Cambridge University Press.

Mayer, R. E., & Moreno, R. (2000). *Cognitive Theory of Multimedia Learning.* Journal of Educational Psychology, 92(1), 117-133.

McCloud, S., & Martin, M. (1993). *Understanding comics: The invisible art* (Vol. 106). Northampton, MA: Kitchen sink press.

McCloud, S. (2000). *Reinventing Comics*. New York, Harper Collins.

Macdonald, I., & MacLeod, M. (2018). *Design education without borders: How students can engage with a socially conscious pedagogy as global citizens*. International Journal of Art & Design Education, 37(2), 312-324.

MacGeorge, R. B. (2024). *Illustrating Tomorrow: The Role of Comics in Engaging Research Participants in Disruptive Futures Research.* World Futures Review, 19467567241249710.

Megawati, F., & Anugerahwati, M. (2012). *Comic strips: A study on the teaching of writing narrative texts to Indonesian EFL students.* Teflin Journal, 23(2), 183.

Meskin, A. (2007). *Defining comics?*. The Journal of Aesthetics and Art Criticism, 65(4), 369-379.

Meyer, M. W., & Norman, D. (2020). *Changing design education for the 21st century*. She Ji: The Journal of Design, Economics, and Innovation, 6(1), 13-49.

Mikkonen, K., & Lautenbacher, O. P. (2019). *Global attention in reading comics: Eye movement indications of interplay between narrative content and layout*. ImageTexT, 10(2).

Miller, S. M. (2007). *English teacher learning for new times: Digital video composing as multimodal literacy practice.* English Education, 40(1), 61-83.

Miller, R. (2008). *Digital Art: Painting with Pixels*. Twenty-First Century Books.

Mohebbi, H. (2017). *Readability of ESP textbooks in Iran: A neglected issue or a taken-for-granted one?*. Journal of Teaching English for Specific and Academic Purposes, 4(3), 641-654.

Monje, E. M. (2011). *Interactive materials, collaborative work and web 2.0 in the context of ESP*. In Technological innovation in the teaching and processing of LSPs: proceedings of TISLID'10 (pp. 101-114).

Moore, K. D. (2014). *Effective instructional strategies: From theory to practice*. Sage Publications.

Moreira, M., Murphy, E., & McAra-McWilliam, I. (2016). *The emergence of an amplified mindset of design: implications for postgraduate design education.* International Journal of Art & Design Education, 35(3), 356-368.

Moreno, R. (2010). *Cognitive load theory: more food for thought.* Instructional Science, 2(38), 135-141.

Morrison, T. G., Bryan, G., & Chilcoat, G. W. (2002). *Using student-generated comic books in the classroom.* Journal of Adolescent & Adult Literacy, 45(8), 758-767.

Muyassaroh, M. N., Asib, A., & Marmanto, S. (2019). *The teacher's beliefs and practices on the use of digital comics in teaching writing: A qualitative case study.* International journal of language teaching and education, 3(1), 45-60.

Nachar, N. (2008). *The Mann-Whitney U: A test for assessing whether two independent samples come from the same distribution.* Tutorials in quantitative Methods for Psychology, 4(1), 13-20.

Nairat, M. (2021). *Generative comics-A computational approach to creating comics material*.[Doctoral Thesis, University of Gothenburg. IT Faculty] http://hdl.handle.net/2077/69634

Nalu, A., & Bliss, J. P. (2011). *Comics as a cognitive training medium for expert decision making*. In Proceedings of the Human Factors and Ergonomics Society Annual Meeting (Vol. 55, No. 1, pp. 2123-2127). Sage CA: Los Angeles, CA: SAGE Publications.

Navarro, D.J & Foxcroft, D.R (2022). *Learning statistics with jamovi: a tutorial for psychology students and other beginners.* (Version 0.75). DOI: 10.24384/hgc3-7p15

Neo, T., & Mitchell, A. (2016). *Beyond the gutter: Interactivity and closure in comics. In Interactive Storytelling: 9th International Conference on Interactive Digital Storytelling*, ICIDS 2016, Los Angeles, CA, USA, November 15–18, 2016, Proceedings 9 (pp. 375-387). Springer International Publishing.

Nguyen, N. V., Rigaud, C., & Burie, J. C. (2018). *Digital comics image indexing based on deep learning.* Journal of Imaging, 4(7), 89.

Nieto, V. G., & Yeste, M. G. (2009). *The" It's a Deal!" graphic adventure: developing intercultural communicative competence in business English*. In Languages for business: a global approach: seminar proceedigs, Ávila, Spain 2009 (pp. 259-271). Prensas de la Universidad de Zaragoza.

Nimasari, E. P. (2016). *An ESP project work for engineering faculty: Boosting students' autonomy learning.* In proceedings International Conference of 63 TEFLIN "Creativity and Innovation in Language Materials Development and Language Teaching Methodology in Asia and Beyond" (pp. 553-557). UNIPA Surabaya.

Nopita, D., Ramadhani, Z., & Elfiza, R. *Designing e-comic for english reading material for grade eight in Tanjungpinang.* (JULIET), 3(2), 85-93.

Nordstokke, D. W., & Zumbo, B. D. (2010). *A new nonparametric Levene test for equal variances.* Psicológica, 31(2), 401-430.

Nordstokke, D. W., Zumbo, B. D., Cairns, S. L., & Saklofske, D. H. (2019). *The operating characteristics of the nonparametric Levene test for equal variances with assessment and evaluation data.* Practical Assessment, Research, and Evaluation, 16(1), 5.

Norris, S. (2004). *Analyzing multimodal interaction: A methodological framework.* Routledge.

Norton, B. (2003). *The motivating power of comic books: Insights from Archie comic readers.* The Reading Teacher, 57(2), 140-147.

Norton, B., & Vanderheyden, K. (2003). *Comic book culture and second language learners.* Critical pedagogies and language learning, 201.

Nugrahani, R., & Wibawanto, W. (2019). *Visual communication design learning in educational institution: Has it been Disrupted?*. PEOPLE Int. J. Soc. Sci., 4(3), 1039-1055.

Nugroho, A., & Rahmawati, A. (2020). *"Let's write a caption!": Utilizing Instagram to enhance ESP students'writing skills.* Jurnal Basis, 7(1), 1-12.

Nugroho, H., Ishartono, N., Agustiani, R., Fitriani, N., Luthfianto, M., Suryawan, I., & Razak, R. B. A. (2024, January). *Integrating adobe flash professional CS6 into ethnomathematics-based learning media to improve students' understanding of math.* In AIP Conference Proceedings (Vol. 2926, No. 1). AIP Publishing.

Nunan, D. (1999). *Second Language Teaching & Learning*. Heinle & Heinle Publishers, 7625 Empire Dr., Florence, KY 41042-2978.

O'Halloran, K. L., Tan, S., & Smith, B. A. (2016). Multimodal approaches to English for academic purposes. In *The Routledge handbook of English for academic purposes* (pp. 256-269). Routledge.

Orlich, D. C., Harder, R. J., Callahan, R. C., Trevisan, M. S. T., & Brown, A. H. (2010). Teaching strategies: A guide to effective instruction. Wadsworth, Cengage Learning.

Osman, H., & Turiman, S. (2022). *Technology-based student-centred ESP writing with genre-based teaching approach*. LSP International Journal, 9, 45-59.

Ostertagova, E., Ostertag, O., & Kováč, J. (2014). *Methodology and application of the Kruskal-Wallis test.* Applied mechanics and materials, 611, 115-120.

O'toole, M. (1994). *The language of displayed art*. Fairleigh Dickinson Univ Press.

Özyel, M., Özdemir, Ç., & Kalajahi, S. A. R. (2012). *Needs of an ESP context: Needs analysis, curriculum & unit design.* Advances in Asian Social Science, 1(3), 265-280.

Paivio, A. (1971). *Imagery and verbal processes*. New York: Holt, Rinehart, and Winston.

Palincsar, A. S. (1998). *Social constructivist perspectives on teaching and learning.* Annual review of psychology, 49(1), 345-375.

Pelech, J. (2010). *The comprehensive handbook of constructivist teaching: From theory to practice*. IAP.

Petersen, R. (2010). *Comics, manga, and graphic novels: a history of graphic narratives.* Bloomsburry Publishing.

Pintrich, P. R. (2000). *Multiple goals, multiple pathways: The role of goal orientation in learning and achievement.* Journal of educational psychology, 92(3), 544.

Pintrich, P. R. (2003). *A motivational science perspective on the role of student motivation in learning and teaching contexts.* Journal of educational Psychology, 95(4), 667.

Polenova, A. Y. (2017). *Constructivism in teaching English for special purposes at tertiary school.* Journal of Economic Regulation, 8(3), 120-128.

Poryadchenko, L., & Lytvynova, S. (2023). *Using Online Services to Create Comics with Elements of AR in the Educational Process of Elementary School.* In Proceedings of the 2nd Myroslav I. Zhaldak Symposium on Advances in Educational Technology (pp. 554-563). Україна.

Prensky, M. (2005). *Listen to the natives.* Educational Leadership, 63(4).

Priego, E., (2016) Comics as Research, Comics for Impact: The Case of Higher Fees, Higher Debts, The Comics Grid: Journal of Comics Scholarship 6, 16. doi: https://doi.org/10.16995/cg.101

Prior, P. (2012). Multimodality and ESP research. *The handbook of English for specific purposes*, 519-534.

Pulungan, A. H. (2023). *Developing teaching tesources for scientific writing based on digital comics.* Asian TESOL Journal, 3(1), 1-14.

Radclyffe-Thomas, N. (2007). *Intercultural chameleons or the Chinese way? Chinese students in Western art and design education.* Art, Design & Communication in Higher Education, 6(1), 41-55.

Radeswandri, Vebrianto, R., & Thahir, M. (2021). *Evaluation on the use of online comics among Students: Development studies at universitas terbuka.* JTP - Jurnal Teknologi Pendidikan, 23(1), 37-48. https://doi.org/10.21009/jtp.v23i1.19084

Rahman, F., Abbas, A., Hasyim, M., Rahman, F., Abbas, A., & Hasyim, M. (2019). *Facebook group as media of learning writing in ESP context: A case study at Hasanuddin University.* Asian EFL Journal Research Articles, 26(6.1), 153-167.

Rajendram, S. (2020). A *pedagogy of multiliteracies and its role in English language education.* In Contemporary foundations for teaching English as an additional language (pp. 151-187). Routledge.

Ramani, E., & Joseph, M. (2002). *The communal reading of comics: a case study of an extensive reading project for adult basic literacy*. Per Linguam: a Journal of Language Learning= Per Linguam: Tydskrif vir Taalaanleer, 18(2), 19-30.

Rampin, R., & Rampin, V. (2021). *Taguette: open-source qualitative data analysis.* Journal of Open Source Software, 6(68), 3522.

Rauscher, A., Stein, D., & Thon, J. N. (2021). *Comics and Videogames.* Taylor & Francis.

Razzouk, R., & Shute, V. (2012). *What is design thinking and why is it important?*. Review of educational research, 82(3), 330-348.

Richie, J. R. (1979). *The funnies aren't just funny: Using cartoons and comics to teach.* The Clearing House: A Journal of Educational Strategies, Issues and Ideas, 53(3), 125-128.

Robbani, A. S., & Khoirotunnisa, U. (2021). O*nline English Comics as Reading Materials for English Language Education Department Students*. European Journal of Educational Research, 10(3), 1359-1369.

Robinson,P.C.(1989) An overview of English for Specific Purposes, In Coleman H. (ed.)*Working with Language:A Multidisciplinary Consideration of Language Use in Work Contexts.Contributions to the Sociology of Language* 52,Berlin:Moutonde Gruyter.pp.395-427.

Robinson,P.C.(1991) *ESP Today: A Practitioner's Guide.* Hemel Mehpstead:PrenticeHall.

Rogers, C., & Medley, F., Jr. (1988). Language with a purpose: using authentic materials in the foreign language classroom. Foreign Language Annals, 21, 467–478.

Rokhayani, A. & Utari, A. R. P. (2014). *The use of comic strips as an English teaching media for junior high school students.* Language Circle: Journal of Language and Literature, 8(2).

Roots, E. (2007). *Making connections: The relationship between epistemology and research methods.* Special Edition Papers, 19(1), 19-27.

Rose, E. J., Macdonald, C. M., & Putnam, C. (2022). *Teaching Design Systems: Towards a flexible and scalable model for the UX classroom*. In Proceedings of the 40th ACM International Conference on Design of Communication (pp. 107-113).

Ross, A. & Willson, V. L. (2017). *Paired samples T-test*. Basic and Advanced Statistical Tests: Writing Results Sections and Creating Tables and Figures, 17-19.

Rovegno, I., & Dolly, J. P. (2006). 3.4 Constructivist perspectives on learning. In K. David, D. Macdonald, & M. O'Sullivan (Eds), *Handbook of physical education*. Sage Publications.

Royce, T. (2002) *Multimodality in the TESOL classroom: Exploring visual-verbal synergy.* TESOL Quarterly 36: 191–205.

Richards, J., & Rodgers, T. (2001). *Approaches and Methods in Language Teaching*. New York, NY: Cambridge University Press.

Richterich, R., & Chancerel, J.-L. (1977). Identifying the Needs of Adults learning a foreign language. Couincil of Europe. Pergamon Press.

Roozafzai, Z. S. (2012). *The Role of Comic Reading Materials in Enhancing the Ability to Read in EFL*. Journal on English Language Teaching, 2(3), 7-15.

Rose, E. J., Macdonald, C. M., & Putnam, C. (2022). *Teaching Design Systems: Towards a flexible and scalable model for the UX classroom.* In Proceedings of the 40th ACM International Conference on Design of Communication (pp. 107-113).

Sagri, M., Sofos, F., & Mouzaki, D. (2018). *Digital Storytelling, comics and new technologies in education: review, research and perspectives.* International Education Journal: Comparative Perspectives, 17(4), 97-112.

Saputra, V. H., & Pasha, D. (2021). C*omics as learning medium during the Covid-19 pandemic.* In Proceeding International Conference on Science and Engineering (Vol. 4, pp. 330-334).

Saraceni, M. (2003). *The language of comics.* Psychology Press.

Savery, J. R., & Duffy, T. M. (1995). *Problem based learning: An instructional model and its constructivist framework*. Educational technology, 35(5), 31-38.

Sayılgan, Ö. (2022). *Hybridity and Agency in Interactive Comic Books: New Forms of Sequential Storytelling.* Interactive Film & Media Journal, 2(2).

Sayılgan, Ö. (2023). *Exploring Interactivity in Digital Comics: A Multifaceted Analysis of Sequential Storytelling.* Interactive Film & Media Journal, 3(1), 97-105.

Schäfer, E. (2017). *Do it yourself! Creative language learning with selfmade web comics.* Foreign Language Education and its Cross-Curricular Links, 81-92.

Scardamalia, M., & Bereiter, C. (1991). *Higher levels of agency for children in knowledge building: A challenge for the design of new knowledge media.* The Journal of the learning sciences, 1(1), 37-68.

Scherer, B. N. (2015). *Visual communication and culture: Design education for a globalized world.* Essentials of Teaching and Integrating Visual and Media Literacy: Visualizing Learning, 75-94.

Schneider, S., Beege, M., Nebel, S., Schnaubert, L., & Rey, G. D. (2022). *The cognitive-affective-social theory of learning in digital environments* (CASTLE). Educational Psychology Review, 34(1), 1-38.

Schweizer, G., & Furley, P. (2016). *Reproducible research in sport and exercise psychology: The role of sample sizes.* Psychology of Sport and Exercise, 23, 114-122.

Schoof, R. N. (1978). *Four-color Words: Comic Books in the Classroom*. Language Arts, 55(7), 821-827.

Schrepp, M. (2023). *User experience questionnaire handbook. All you need to know to apply the UEQ successfully in your project.* https://www.ueq-online.org/Material/Handbook.pdf

Shapiro, S. S., & Wilk, M. B. (1965). *An analysis of variance test for normality (complete samples)*. Biometrika, 52(3-4), 591-611.

Sharan, Y., & Sharan, S. (1987). *Training teachers for cooperative learning.* Educational Leadership, 45(3), 20-25.

Sharma, K., & Giannakos, M. (2020). *Multimodal data capabilities for learning: What can multimodal data tell us about learning?*. British Journal of Educational Technology, 51(5), 1450-1484.

Shipka, J. (2005). *A multimodal task-based framework for composing.* College Composition and Communication, 277-306.

Skinner, E., and Margaret C. Hagood. *Developing literate identities with English language learners through digital storytelling.* The Reading Matrix: An International Online Journal 8.2 (2008).

Slavin, R. E. (1990). *Research on cooperative learning: Consensus and controversy*. Educational leadership, 47(4), 52-54.

Soares de Lima, E., Feijó, B., Furtado, A. L., Diniz Junqueira Barbosa, S., Pozzer, C. T., & Ciarlini, A. E. (2013). *Non-branching interactive comics.* In Advances in Computer Entertainment: 10th International Conference, ACE 2013, Boekelo, The Netherlands, November 12-15, 2013. Proceedings 10 (pp. 230-245). Springer International Publishing.

Sousanis, Nick. *Unflattening.* Cambridge, MA: Harvard University Press, 2015.

Sones, W. W. D. (1944). *The comics and instructional method.* The Journal of Educational Sociology, 18(4), 232-240.

Sukarni, S., & Imansyah, I. (2022). *Needs analysis of English for fine arts study program students as a basis to design English teaching materials.* Linguistics and ELT Journal, 10(1), 43-47.

Strevens, P. (1977). *New Orientations in the Teaching of English*. Oxford, UK: Oxford University Press.

Swales, J. (1985). Episodes in ESP. Oxford: Pergamon Press.

Sweller, J., Van Merrienboer, J. J., & Paas, F. G. (1998). *Cognitive architecture and instructional design.* Educational psychology review, 10, 251-296.

Tam, M. (2000). *Constructivism, instructional design, and technology: Implications for transforming distance learning.* Journal of Educational Technology & Society, 3(2), 50-60.

Tarnopolsky, O. (2012). *Constructivist blended learning approach: to teaching English for specific purposes*. Walter de Gruyter.

Tashakkori, A., & Teddlie, C. (1998). *Mixed methodology: Combining qualitative and quantitative approaches* (Vol. 46). Sage.

Terry, G., Hayfield, N., Clarke, V., & Braun, V. (2017). Thematic analysis. In Willig, C., & Rogers, W. S. (Eds.). *The SAGE handbook of qualitative research in psychology*. Sage. 2(17-37).

Thon, J. N., & Wilde, L. R. (2016). *Mediality and materiality of contemporary comics.* Journal of Graphic Novels and Comics, 7(3), 233-241.

Topkaya, Y., Batdı, V., Burak, D., & Özkaya, A. (2023). T*he Effectiveness of Using Comics in Education: A Meta-analytic and Meta-thematic Analysis Study.* Ahmet Keleşoğlu Eğitim Fakültesi Dergisi, 5(3), 922-940.

Tsai, S. C., & Davis, B. (2008). *The Trade fair: Introducing ESP multimedia at a technical university in Taiwan.* International Journal of Emerging Technologies in Learning (iJET), 3(3), 45-55.

Tsai, S. C. (2012). *Integration of multimedia courseware into ESP instruction for technological purposes in higher technical education.* Journal of Educational Technology & Society, 15(2), 50-61.

Tynjälä, P. (1999). *Towards expert knowledge? A comparison between a constructivist and a traditional learning environment in the university.* International journal of educational research, 31(5), 357-442.

Toprak, T. E. (2019). *Analysis of differences between groups: The t-test and the analysis of variance (ANOVA) in language assessment.* In Quantitative Data Analysis for Language Assessment Volume I (pp. 179-197). Routledge.

Trimurtini, T., Setyani, M. A., Sari, E. F., & Nugraheni, N. (2021). *Development of mind mapping-based comics to improve math learning outcomes*. Premiere Educandum: Journal of Basic Education and Learning, 11(1), 15.

Tobita, H. (2010, May). *Comic engine: interactive system for creating and browsing comic books with attention cuing.* In Proceedings of the International Conference on Advanced Visual Interfaces (pp. 281-288).

Toyoura, M., Sawada, T., Kunihiro, M., & Mao, X. (2012). *Using eye-tracking data for automatic film comic creation.* In Proceedings of the Symposium on Eye Tracking Research and Applications (pp. 373-376).

Ucan, B. (2017). *Karikatürün bilgisayar destekli analizi: Türkiye-Avustralya mukayesesi* [Doctoral dissertation, Yildiz Technical University]. http://dspace.yildiz.edu.tr/xmlui/handle/1/12066

Ueno, M., Mori, N., Suenaga, T., & Isahara, H. (2016). *Estimation of structure of four-scene comics by convolutional neural networks.* In Proceedings of the 1st International Workshop on coMics ANalysis, Processing and Understanding (pp. 1-6).

Uzun, K., & Topkaya, E. Z. (2018). *The effect of genre-based instruction on foreign language writing anxiety.* Journal of Language and Linguistic Studies, 14(4), 243-258.

van der Sluis, H., (2021) "Manga, graphic novels, and comics in Higher Education?", New Vistas 7(1), 24-30. doi: https://doi.org/10.36828/newvistas.93

Van Leeuwen, T. (2011). *Multimodality and multimodal research*. Visual research methods, 549-569.

Vygotsky, L. S., (1978). *Mind in society: Development of higher psychological processes.* Harvard university press.

Wallner, L., & Barajas, K. E. (2020). *Using comics and graphic novels in K-9 education: An integrative research review.* Studies in Comics, 11(1), 37-54.

Wang, F., & Suwanthep, J. (2017). *Constructivism-based mobile application for EFL vocabulary learning*. International Journal of Learning, 3(2), 106-112.

Wannas, A. S., & Hassan, I. H. (2023). *Does social media impact the development of general English vocabulary? perceptions of Egyptian university students.* Insights into Language, Culture and Communication, 3(1), 30-43.

Welch, B. L. (1947). "*The generalization of "Student's" problem when several different population variances are involved"*. Biometrika. 34 (1–2): 28–35. doi:10.1093/biomet/34.1-2.28. MR 0019277. PMID 20287819

Werschler, D. (2011). *Digital comics, circulation, and the importance of being Eric Sluis*. Cinema Journal, 50:3.

West, R. (1994). *Needs analysis in language teaching.* Language teaching, 27(1), 1-19.

Wigand, R. T. (1986). Toward a more visual culture through comics. *Comics and visual culture: research studies from ten countries*, 28-61.De Gruyter.

Wilde, L. (2015). *Distinguishing mediality: The problem of identifying forms and features of digital comics.* Networking Knowledge: Journal of the MeCCSA Postgraduate Network, 8(4).

Wiley, D. E., & Bock, R. D. (1967). *Quasi-experimentation in educational settings: Comment.* The School Review, 75(4), 353-366.

Williams, C. (2014). *The future of ESP studies: building on success, exploring new paths, avoiding pitfalls*. ASp. la revue du GERAS, (66), 137-150.

Williams, T. L. (2007). *"Reading" the painting: Exploring visual literacy in the primary grades.* The Reading Teacher, 60(7), 636-642.

Wilson, B. G. (1996). *Constructivist learning environments: Case studies in instructional design*. Educational Technology.

Wijaya, E. A., Suwastini, N. K. A., Adnyani, N. L. P. S., & Adnyani, K. E. K. (2021). *Comic strips for language teaching: The benefits and challenges according to recent research.* ETERNAL (English, Teaching, Learning, and Research Journal), 7(1), 230-248.

Winarti, H., Masrupi, & Juniardi, Y. (2018). *English digital comics for the students of senior high school in Banten*. In AISELT(pp. 231–240).

Worth, S. (2016). *Studying visual communication*. University of Pennsylvania Press.

Varnum, R., & Gibbons, C. T. (Eds.). (2001). *The language of comics: Word and image.* Univ. Press of Mississippi.

Varma, S. (2006). *Preliminary item statistics using point-biserial correlation and p-values.* Educational Data Systems Inc.: Morgan Hill CA., 16(07), 1-7.

von Reumont, F., & Budke, A. (2020). *Strategies for successful learning with geographical comics: An eye-tracking study with young learners*. Education Sciences, 10(10), 293.

Yanto, E. S., & Umah, S. (2023). *Vocational students' engagement in digital comic strip assisted reading comprehension.* Jurnal Ilmiah Wahana Pendidikan, 9(2), 133-152.

Yin, R. K. (2009). *Case study research: Design and methods* (Vol. 5). Sage.

Young, M. (2008). *From constructivism to realism in the sociology of the curriculum.* Review of research in education, 32(1), 1-28.

Zhang, J., & Lin, H. (2018). *The new developments of constructivism theory and its reflection on college English teaching in the era of new media–A case study of international textile trade English*. Theory and Practice in Language Studies, 8(6), 649-655.

Zimmerman, D. W. (1997). *Teacher's corner: A note on interpretation of the paired-samples t test.* Journal of educational and behavioral statistics, 22(3), 349-360.

Zimmerman, B. (2008). *Creating comics fosters reading, writing and creativity.* Education Digest, 74(4), 55-57.

Zimmerman, B. (2010). *Using digital comics for language learning*. ELearn, 2010(1).

Živković, S. (2014). *Constructivism–an emerging trend in ESP teaching and learning.* In LLCE2014: Conference proceedings (p. 19).

APPENDICES

Appendix A. Ethics Committee Approval

Appendix B. Informed Consent Forms

Appendix C. Learning Profile Survey

Appendix D. Diagnostic Level Test

Appendix E. Reading Comics for Educational Purposes Survey

Appendix F. Pre-Test-Post-Test Assessments

Appendix G. Approval for Use of IMMS-SU

Appendix H. Instructional Material Motivation Survey-Single Use

Appendix I. Turkish Version of User Experience Questionnaire

Appendix J. Focus Group Discussion Protocols

Appendix K. Excerpts from High-Fidelity Prototype of "Norm(s) of Design Language"- Chapter 1

Appendix L. Final Design of "Norm(s) of Design Language"- Chapter 1

Appendix M. Excerpts from Ongoing Design of the Final Launch of *NDL 1.0.*

Appendix N. Physical Comic Group Interview Transcript

Appendix O. Interactive Comic Group Interview Transcript

Appendix P. Funding Acknowledgement

Appendix A. Ethics Committee Permission



YILDIZ TEKNİK ÜNİVERSİTESİ
Sosyal ve Beşeri Bilimler Araştırmaları Etik Kurulu

Toplantı Tarihi: 05.12.2023 **Toplantı No: 2023.12**

SOSYAL VE BEŞERİ BİLİMLER ARAŞTIRMALARI ETİK KURULU TOPLANTI KARARI

Yürütücülüğünü Üniversitemiz Sosyal Bilimler Enstitüsü öğretim üyelerinden Doktor Öğretim Üyesi Umut Burcu Tasa Yurtsever danışmanlığında lisansüstü öğrencisi MERAL ŞENTÜRK tarafından yapılacak olan "Çizgi Roman Ve İnteraktif Çizgi Roman Tasarım Öğrencilerinin Mesleki Dil Becerilerini Ve Öğrenme Deneyimlerini Geliştirmeye Yönelik Karşılaştırmalı Bir Çalışma" adlı çalışma ve bu çalışmada kullanılacak veri toplama araçları ve yöntemlerine ilişkin bilgilerde etiğe aykırı herhangi bir bulguya rastlanmamıştır.

Etik Kurul Üyeleri

[redacted]
Prof. Dr. Murat DÖNDÜREN
Başkan

[redacted]
Prof. Dr. Ali ERYILMAZ
Üye

[redacted]
Prof. Dr. Gülnayat GÖLBAŞI ŞİMŞEK
Üye

[redacted]
Prof. Dr. Senay OĞUZTİMUR
Üye

[redacted]
Prof. Dr. Yasin ŞEHİTOĞLU
Üye

[redacted]
Doç. Dr. Mehmet Emin KAHRAMAN
Üye

[redacted]
Dr. Öğr. Üyesi Güzin AKYILDIZ
Üye

Appendix B. Informed Consent Forms-I

11/12/2023

KATILIMCILARIN GÖNÜLLÜLÜĞÜ VE AYDINLATILMIŞ ONAM FORMU

Bu çalışma, "Çizgi roman ve İnteraktif Çizgi Roman: Tasarım Öğrencilerinin Mesleki Dil Becerilerini ve Öğrenme Deneyimlerini Geliştirmeye Yönelik Karşılaştırmalı Bir Çalışma" başlıklı bir araştırma çalışması olup yüksek lisans tez amacı taşımaktadır. Çalışma, İnteraktif Medya Tasarımı yüksek lisans öğrencisi Meral ŞENTÜRK tarafından yürütülmekte ve sonuçları ile geliştirilen çizgi roman ve interaktif çizgi roman'nın öğrencilerin mesleki dil becerileri ve öğrenme deneyimleri üzerindeki etkileri araştırılacaktır.

- Bu çalışmaya katılımınız gönüllülük esasına dayanmaktadır.
- Çalışmanın amacı doğrultusunda, materyalin değerlendirilmesinde kullanılmak üzere ön-test ve son-test, çoktan seçmeli sorular içeren üç adet anket ve yarı yapılandırılmış sorular içeren mülakat yapılarak sizden veriler toplanacaktır.
- İsminizi yazmak ya da kimliğinizi açığa çıkaracak bir bilgi vermek zorunda değilsiniz/araştırmada katılımcıların isimleri gizli tutulacaktır.
- Odak grup görüşmesinde 7 adet açık uçlu soru bulunmakta ve yaklaşık 25 – 30 dk. süreceği ön görülmektedir.
- Araştırma kapsamında toplanan veriler, sadece bilimsel amaçlar doğrultusunda kullanılacak, araştırmanın amacı dışında ya da bir başka araştırmada kullanılmayacak ve gerekmesi halinde, sizin (yazılı) izniniz olmadan başkalarıyla paylaşılmayacaktır.
- İstemeniz halinde sizden toplanan verileri inceleme hakkınız bulunmaktadır.
- Sizden toplanan veriler akademik etik kurallarına uygun olarak korunacak ve araştırma bitiminde arşivlenecek veya imha edilecektir.
- Veri toplama sürecinde/süreçlerinde size rahatsızlık verebilecek herhangi bir soru/talep olmayacaktır. Yine de katılımınız sırasında herhangi bir sebepten rahatsızlık hissederseniz çalışmadan istediğiniz zamanda ayrılabileceksiniz. Çalışmadan ayrılmanız durumunda sizden toplanan veriler çalışmadan çıkarılacak ve imha edilecektir.

Gönüllü katılım formunu okumak ve değerlendirmek üzere ayırdığınız zaman için teşekkür ederim.

Çalışma hakkındaki sorularınızı Yıldız Teknik Üniversitesi İnteraktif Medya Tasarım bölümü yüksek lisans öğrencisi Meral ŞENTÜRK' e (mail/tel) yöneltebilirsiniz.

Araştırmacı Adı: Meral SENTURK
Cep Tel: [redacted]
Mail: [redacted]

Bu çalışmaya tamamen kendi rızamla, istediğim takdirde çalışmadan ayrılabileceğimi bilerek verdiğim bilgilerin bilimsel amaçlarla kullanılmasını kabul ediyorum.
(Lütfen bu formu doldurup imzaladıktan sonra veri toplayan kişiye veriniz.)

Katılımcı Ad ve Soyadı:
İmza:
Tarih:

Appendix B. Informed Consent Forms-II

11/12/2023

BİLGİLENDİRİLMİŞ OLUR FORMU

1. Aşağıda imzası olan ben "Çizgi roman ve İnteraktif Çizgi Roman: Tasarım Öğrencilerinin Mesleki Dil Becerilerini ve Öğrenme Deneyimlerini Geliştirmeye Yönelik Karşılaştırmalı Bir Çalışma" başlıklı çalışmaya katılmayı kabul ediyorum.

2. Bu çalışmayı yürüten Meral ŞENTÜRK çalışmanın yapısı, amacı ve muhtemel süresi, hakkında ayrıntılı sözlü ve yazılı bilgi verdi.

3. Araştırmacı Meral ŞENTÜRK'e çalışmasıyla ilgili her soruyu sorma fırsatını buldum. Cevapları ve bana verilen bilgiyi anladım.

4. Araştırmacı Meral ŞENTÜRK'e bilgilerin ayrıntılarını açıklamama ve benimle ilgili sırları koruması şartıyla benimle bu çalışmayı yapmasına izin veriyorum.

5. Çalışma boyunca tüm kurallara uyacağıma, araştırmacı Meral ŞENTÜRK ile tam bir uyum içinde çalışacağıma ve konuyla ilgili herhangi bir sorun çıktığında hemen onu arayacağımı kabul ediyorum.

6. Bu çalışma sonuçlarının kullanılmasını kısıtlamayacağımı ve yayın, rapor ve benzeri bilimsel dokümanlarda kullanabileceğini kabul ediyorum.

7. Bu çalışmadan istediğim zaman çıkabileceğimi anladım.

OKUDUM VE ONAYLADIM.

Katılımcının Adı ve Soyadı:

Adresi:

Tarih:

İmza:

Araştırmacının Adı ve Soyadı:

Adresi:

Tarih:

İmza:

Appendix C. Learning Profile Survey

LEARNING PROFILE SURVEY

1 In your language, are reading and writing easy or difficult for you? _____

2 How did you learn to read and write? (Circle one.) school family tutor other

3 Years of education: (Circle last year completed.) 5 6 7 8 9 10 11 12 13 14 15 16
(elementary) (secondary) (university)

4 Other languages you speak: _____

5 Other languages you read or write: _____

6 What type of materials do you like to read in your language? _____

_____

7 What do you write in your language? (Circle one.)
emails stories lists notes other _____

8 Have you studied English before? Yes / No Where? _____

9 How long have you studied English? _____

10 Describe your ability in English: (Circle the best description.)

Understanding is ...	always difficult	sometimes difficult	never difficult
Speaking is ...	always difficult	sometimes difficult	never difficult
Reading is ...	always difficult	sometimes difficult	never difficult
Writing is ...	always difficult	sometimes difficult	never difficult

11 Why do you want to learn English? _____

12 What is the most important thing you want to learn? _____

_____

13 What questions do you have about this course? _____

_____

The student completed this form: (Circle one) Alone With assistance

Signature of person helping student provide information: _____

Appendix D. Diagnostic Level Test

Name: _____ **Date:** _____

DIAGNOSTIC LEVEL TEST

Circle the correct letter.

---

1 I'm 18 and my brother is 20, so he's ..... me.
a the oldest of
b older than
c as old as

2 Carl's very ..... . He's never late, and he never forgets to do things.
a reliable
b patient
c strict

3 We stayed in a lovely villa ..... the sea.
a it overlooks
b overlooked
c overlooking

4 Not until the 1980s ..... for the average person to own a computer.
a it was possible
b was it possible
c was possible

5 Jan ..... her arm on a hot iron.
a broke
b burned
c sprained

6 Tomorrow's a holiday, so we ..... go to work.
a have to
b mustn't
c don't have to

7 I usually ..... swimming at least once a week.
a go
b do
c play

8 My friend Siena ..... to Russia last year.
a went
b has gone
c has been

9 This is ..... area, with a lot of factories and warehouses.
a an agricultural
b an industrial
c a residential

10 If I ..... well in my exams, I ..... to university.
a will do; will go
b will do; go
c do; will go

11 She was so upset that she burst ..... tears.
a into
b out
c with

12 Where did you go ..... holiday last year?
a for
b on
c to

13 Ocean currents ..... play an important part in regulating global climate.
a are known to
b thought to
c are believed that they

14 My cousin ..... getting a job in Bahrain.
a would like
b is planning
c is thinking of

15 I can't ..... your hair, because I haven't got any scissors.
a brush
b cut
c wash

16 I wish I ..... have an exam tomorrow!
a don't
b didn't
c won't

17 The government plans to ..... taxes on sales of luxury items.
a increase
b expand
c go up

18 When I first moved to Hong Kong, life in a different country was very strange, but now I'm used ..... here.
a living
b to live
c to living

19 There ..... milk in the fridge.
a is some
b are some
c is a

20 Criminals are people who are guilty of ..... the law.
a breaking
b cheating
c committing

21 Why on earth isn't Josh here yet? ..... for him for over an hour!
a I'm waiting
b I've been waiting
c I've waited

22 "It's pouring down, and it's freezing." What are the weather conditions?
a high winds and snow
b heavy rain and cold temperatures
c thick cloud but quite warm

23 ..... feeling OK? You don't look very well.
a Do you
b You are
c Are you

24 Daniel's hair is getting far too long; he should ..... soon.
a cut it
b have cut it
c have it cut

25 Mandy works for a computer software company. She got ..... recently, and so now she's an area manager.
a made redundant
b promoted
c a raise

26 I can't hear you – it's ..... noisy in here.
a too
b too much
c too many

27 Jamal has just sent me ..... to arrange plans for this weekend.
a a blog
b an email
c a website

28 I promise I'll call you as soon as I ..... .
a I arrive
b I arrived
c I'll arrive

29 Photographers and designers need to be very ..... .
a creative
b fit
c annoying

30 The global financial crisis, ... is forcing lots of small businesses to close, does not look set to end soon.
a it
b that
c which

31 There ..... a terrible accident if the pilot hadn't reacted so quickly.
a had been
b was
c would have been

32 "Are you ready to order?"
"Not yet – I'm still looking at the ..... ."
a bill
b menu
c service

33 "My job is never boring."
The speaker's job is always ..... .
a interesting
b popular
c difficult

34 I've been working here ..... about the last two years.
a during
b for
c since

35 "It leaves from Platform 2 at 4.15."
The speaker is talking about ..... .
a an airline flight
b a train
c a taxi

36 I went to a lovely ..... last Saturday. The bride was my best friend when we were at school.
a anniversary
b marriage
c wedding

37 "I've got a headache."
"Maybe you ..... to take an aspirin."
a should
b ought
c don't

38 The patient had an ..... to insert metal pins in his broken leg.
a injection
b operation
c X-ray

39 She won a seat in parliament at the last ..... .
a general election
b opinion poll
c referendum

40 I'm surprised you didn't get upset. If someone said that to me, ... really angry.
a I'm
b I was
c I'd be

41 This used to be ..... part of the city, but since the old buildings were renovated it's become a very fashionable area.
a an affluent
b a run-down
c a trendy

42 Cassie went to bed early because she was ..... .
a tired
b stressed
c relaxed

43 In the 1960s, computers were ..... expensive that ordinary people couldn't afford them.
a so
b such
c too

44 Do you want ..... the match tonight?
a watching
b watch
c to watch

45 Researchers claim the new discovery is a major ..... in the fight against malaria.
a breakthrough
b investigation
c progress

46 The Maths problem was really difficult and I just couldn't ..... the answer.
a check in
b set off
c work out

47 When I was a child, I never ..... about the future.
a have worried
b used to worry
c was worrying

48 A local politician has ..... charges of corruption made by the opposition party.
a accused
b blamed
c denied

49 ..... worries me about society today is how completely we have come to depend on technology.
a That
b What
c Which

50 Cats and dogs are usually kept as ..... .
a farm animals
b wild animals
c pets

Name: _____ **Date:** _____

STUDENT ANSWER SHEET

DIAGNOSTIC LEVEL TEST

Circle the correct letter.

1	**a**	**b**	**c**	**11**	**a**	**b**	**c**	**21**	**a**	**b**	**c**	**31**	**a**	**b**	**c**	**41**	**a**	**b**	**c**
2	**a**	**b**	**c**	**12**	**a**	**b**	**c**	**22**	**a**	**b**	**c**	**32**	**a**	**b**	**c**	**42**	**a**	**b**	**c**
3	**a**	**b**	**c**	**13**	**a**	**b**	**c**	**23**	**a**	**b**	**c**	**33**	**a**	**b**	**c**	**43**	**a**	**b**	**c**
4	**a**	**b**	**c**	**14**	**a**	**b**	**c**	**24**	**a**	**b**	**c**	**34**	**a**	**b**	**c**	**44**	**a**	**b**	**c**
5	**a**	**b**	**c**	**15**	**a**	**b**	**c**	**25**	**a**	**b**	**c**	**35**	**a**	**b**	**c**	**45**	**a**	**b**	**c**
6	**a**	**b**	**c**	**16**	**a**	**b**	**c**	**26**	**a**	**b**	**c**	**36**	**a**	**b**	**c**	**46**	**a**	**b**	**c**
7	**a**	**b**	**c**	**17**	**a**	**b**	**c**	**27**	**a**	**b**	**c**	**37**	**a**	**b**	**c**	**47**	**a**	**b**	**c**
8	**a**	**b**	**c**	**18**	**a**	**b**	**c**	**28**	**a**	**b**	**c**	**38**	**a**	**b**	**c**	**48**	**a**	**b**	**c**
9	**a**	**b**	**c**	**19**	**a**	**b**	**c**	**29**	**a**	**b**	**c**	**39**	**a**	**b**	**c**	**49**	**a**	**b**	**c**
10	**a**	**b**	**c**	**20**	**a**	**b**	**c**	**30**	**a**	**b**	**c**	**40**	**a**	**b**	**c**	**50**	**a**	**b**	**c**

ANSWER KEY

1	**b**	**11**	**a**	**21**	**b**	**31**	**c**	**41**	**b**
2	**a**	**12**	**b**	**22**	**b**	**32**	**b**	**42**	**a**
3	**c**	**13**	**a**	**23**	**c**	**33**	**a**	**43**	**a**
4	**b**	**14**	**c**	**24**	**c**	**34**	**b**	**44**	**c**
5	**b**	**15**	**b**	**25**	**b**	**35**	**b**	**45**	**a**
6	**c**	**16**	**b**	**26**	**a**	**36**	**c**	**46**	**c**
7	**a**	**17**	**a**	**27**	**b**	**37**	**b**	**47**	**b**
8	**a**	**18**	**c**	**28**	**a**	**38**	**b**	**48**	**c**
9	**b**	**19**	**a**	**29**	**a**	**39**	**a**	**49**	**b**
10	**c**	**20**	**a**	**30**	**c**	**40**	**c**	**50**	**c**

Appendix G. Reading Comics for Educational Purposes Survey

Eğitsel Amaçlı Çizgi Roman OkumaTutum Anketi

1. Cinsiyetiniz

- ◯ Kadın
- ◯ Erkek
- ◯ Belirtmek istemiyorum

2. Boş zamanlarınızda çizgi roman okuma fikri sizce nasıldır?

	1	2	3	4	5	6	
Çok kötü	◯	◯	◯	◯	◯	◯	**Çok iyi**

3. Çizgi romanlardan bilgi edinme fikrini nasıl buluyorsunuz?

	1	2	3	4	5	6	
Çok kötü	◯	◯	◯	◯	◯	◯	**Çok iyi**

4. Çizgi roman okuyarak İngilizcenizi geliştirme fikrini nasıl bulursunuz?

	1	2	3	4	5	6	
Çok kötü	◯	◯	◯	◯	◯	◯	**Çok iyi**

5. Çizgi roman okuyarak mesleki bilginizi geliştirme fikrini nasıl bulursunuz?

	1	2	3	4	5	6	
Çok kötü	◯	◯	◯	◯	◯	◯	**Çok iyi**

6. Bir çizgi romanın ders kitabı olarak okunması düşüncesini nasıl karşılarsınız?

	1	2	3	4	5	6	
Çok kötü	◯	◯	◯	◯	◯	◯	**Çok iyi**

7. Sınıfta dijital bir çizgi roman üzerinden okuma yapılmasını nasıl karşılarsınız?

	1	2	3	4	5	6	
Çok kötü	◯	◯	◯	◯	◯	◯	**Çok iyi**

8. Sınıfta dijital interaktif bir çizgi roman üzerinden okuma yapılmasını nasıl karşılarsınız?

	1	2	3	4	5	6	
Çok kötü	◯	◯	◯	◯	◯	◯	**Çok iyi**

9. Sınıfta basılı bir çizgi roman üzerinden okuma yapılmasını nasıl karşılarsınız?

	1	2	3	4	5	6	
Çok kötü	◯	◯	◯	◯	◯	◯	**Çok iyi**

Appendix F. Pre-Test-Post-Test Assessments - I

ILT3931 ENGLISH FOR DESIGN PRE-TEST 1

Read the given statements and fill in the blanks with appropriate word(s).

TENTATIVE – FLEXIBILITY- ITERATIVE – REFLEXIVITY – ACCESSIBILITY (x3) – USABILITY

1- _____ addresses the inclusive practice of ensuring there are no constraints that limit interaction with a website or product.

2- People can listen or read a captioned video to understand it. A design should be customizable to a wide range of tastes and abilities.

The statement above is related to the aspect of _____.

3- Universal design is a(n) _____ process. So, continuously gather feedback, evaluate your design's effectiveness, and make improvements based on user insights.

4- _____ issues generally affect all users, both users with and without disabilities. All users have difficulty using a website. _____issues occur solely for people with disabilities when they have difficulty using or accessing a website without problems.

5- Universal design is closely related to _____.

Your Code: **Group:**

ILT3931 ENGLISH FOR DESIGN PRE-TEST 2

Read the given statements and fill in the blanks with appropriate word(s).

AFFORDANCE – SIGNIFIER – INTERACTION DESIGN PRINCIPLES – GESTALT PRINCIPLES DISCOVERABILITY – ACCESSIBILITY – CONCEPTUAL MODELS

1- _____ are abstract, psychological representations of how tasks should be carried out.

2- A(n) _____ is what a user can do with an object based on the user's capabilities.

3- A (n) _____ is some sort of perceivable cue about the affordance.

4- _____ are laws of human perception that describe how humans group similar elements, recognize patterns and simplify complex images.

5- In user experience design, _____ refers to how simple it is for users to understand, find, recognize, and use a design product's features and functions.

Your Code: **Group:**

Appendix F. Pre-Test-Post-Test Assessments - III

ILT3931 ENGLISH FOR DESIGN PRE-TEST 3

Read the given statements and fill in the blanks with appropriate word(s).

CONSTRAINTS- AFFORDANCES- NATURAL MAPPING- FEEDBACK- FEEDFORWARD PHYSICAL CONSTRAINTS- SIGNIFIER

1- _____ should be natural and intuitive and mimic what we see in the world. As designers, we should produce user-friendly interfaces and experiences that closely adhere to the universally-accepted standard.

2- _____ can be broken down into four categories: physical, cultural, logical, and semantic.

3- Norman doors lack _____—do you push or pull them? These doors often have identical handles on both sides, making it unclear which side to use.

4- _____ depend(s) on physical properties and do not require special training or knowledge to do things correctly. They automatically prevent the user from doing them wrong.

5- _____ is the principle of making it clear to the user what action has been taken and what has been accomplished.

Your Code: **Group:**

Appendix G. Approval for Use of IMMS-SU

Meral Şentürk [redacted]

IMMS Türkçe Ölçek Gmail

Esra BARUT TUĞTEKİN [redacted] Mon, Oct 23, 2023 at 1:03 PM
To: Meral Şentürk [redacted]

Sayın Meral Şentürk,

Geliştiricisi olduğum Öğretim Materyali Motivasyon Ölçeği'ni akademik atıf gösterme kurallarına uygun olmak koşulu ile yüksek lisans tezinizde kullanabilirsiniz.
Ölçeğe dair detaylı bilgiler e-posta ekinde yer almaktadır.

İyi çalışmalar dilerim.

Meral Şentürk [redacted], 23 Eki 2023 Pzt, 12:37 tarihinde şunu yazdı:
[Quoted te t hidden]

--
Doç. Dr. Esra BARUT TUĞTEKİN
İnönü Üniversitesi
Uzaktan Eğitim Uygulama ve Araştırma Merkezi Müdürü
Malatya/Türkiye

Assoc. Prof. Dr. Esra BARUT TUĞTEKİN
Inonu University
Director of Distance Education Application and Research Centre
Malatya/Türkiye

Öğretim Materyaline Yönelik Motivasyon Ölçeği Bilgilendirme Formu.docx
13K

Appendix H. Instructional Material Motivation Survey-Single Use

Değerli katılımcı,
Aşağıda öğrenim gördüğünüz materyal ile ilgili motivasyonunuzun belirlenmesine yönelik oluşturulmuş bir veri toplama aracı bulunmaktadır. Lütfen aşağıda verilen ifadelerde size en uygun gelen seçeneği işaretleyiniz. Yanıtlarınız sadece bilimsel amaçlarla kullanılacaktır. Veri toplama aracından elde edilecek veriler toplu olarak değerlendirilecektir. Veri toplama aracını samimi ve içtenlikle doldurmanız bizim için önemlidir. Katılımınız gönüllülük esasına dayanmakta olup sağlayacağınız destek için teşekkür ederiz.

Cinsiyetiniz: Kadın ○ Erkek ○ Belirtmek İstemiyorum ○

Öğretim Materyali Motivasyon Ölçeği **"Instructional Material Motivation Scale for Single-Use" (IMMS-SU)**	**Hiç Katılmıyorum**	**Katılmıyorum**	**Kararsızım**	**Katılıyorum**	**Tamamen Katılıyorum**
1. Bu materyal ile beklediğimden daha kolay öğrendim.	1	2	3	4	5
2. Bu materyal ile öğrendiklerimi kolaylıkla hatırlarım.	1	2	3	4	5
3. Bu materyalde önemli bilgileri fark etmemi sağlayan özellikler vardı.	1	2	3	4	5
4. Bu materyal ile öğrenirken keyif aldım.	1	2	3	4	5
5. Bu materyal merak uyandırıcıydı.	1	2	3	4	5
6. Bu materyal konuya odaklanmamı sağladı.	1	2	3	4	5
7. Bu materyal ile çalışmanın benim için yararlı olacağına inandım.	1	2	3	4	5
8. Bu materyal başarılı olabileceğime yönelik inancımı artırdı.	1	2	3	4	5
9. Zor konularda da böyle materyallerle öğrenmeyi tercih ederim.	1	2	3	4	5
10. Bu materyal ilgi çekici özellikler içeriyordu.	1	2	3	4	5
11. Bu materyal öğrenme isteğimi artırdı.	1	2	3	4	5
12. Bu materyali sonuna kadar zevkle takip ettim.	1	2	3	4	5
13. Bu materyal ile öğrenirken daha az çaba harcadım.	1	2	3	4	5
14. Bu materyal ile öğrenmek benim için heyecan vericiydi.	1	2	3	4	5

Katılımınız için teşekkür eder, akademik hayatınızda başarılar dileriz.

Appendix I. Turkish Version of User Experience Questionnaire

Değerli katılımcı,

Anket, bir tasarım ürünü ile ilişkilendirilebilecek birbirine zıt özellikler (toplamda 26 çift) içermektedir. Bu özellikler arasındaki kareler, zıtlıklar arasındaki dereceleri temsil etmektedir. Tasarım ürününe dair izleniminizi, her özellik için dairelerden yalnızca birini işaretleyerek göstermelisiniz.

Örnek:

yararsız	☐	☐	☐	☐	☐	☒	☐	yararlı

-Yukarıdaki gibi bir işaretleme, kullanılan tasarım ürününün "yararsız" bulmaktan çok "yararlı" bulduğunuzu ifade edecektir.

-Lütfen üzerinde çok düşünmeden karar verin ve ilk izleniminizi yansıtacak yanıtı vermeye çalışın.

-Bazen verdiğiniz karardan tamamiyle emin olamayabilirsiniz veya seçtiğiniz yanıtın ürünle tam olarak ilişkili olamayacağını düşünebilirsiniz. Yine de, mutlaka her satırdaki karelerden birini işaretleyerek bir seçim yapınız.

-Önemli olan sizin kişisel fikriniz. Lütfen burada doğru veya yanlış yanıt olmadığını unutmayın!

Cinsiyetiniz: Kadın ☐ Erkek ☐ Belirtmek İstemiyorum ☐

Lütfen çizgi romana ilişkin değerlendirmenizi, her sıradan yanlızca bir kutucuğu işaretleyerek yapınız.

	1	2	3	4	5	6	7		
tatsız	☐	☐	☐	☐	☐	☐	☐	memnun edici	1
anlaşılmaz	☐	☐	☐	☐	☐	☐	☐	anlaşılır	2
yaratıcı	☐	☐	☐	☐	☐	☐	☐	yaratıcı değil	3
kolay öğrenilir	☐	☐	☐	☐	☐	☐	☐	öğrenilmesi zor	4
değerli	☐	☐	☐	☐	☐	☐	☐	bayağı	5
sıkıcı	☐	☐	☐	☐	☐	☐	☐	heyecan verici	6
ilginç değil	☐	☐	☐	☐	☐	☐	☐	ilginç	7
tahmin edilemez	☐	☐	☐	☐	☐	☐	☐	tahmin edilebilir	8
hızlı	☐	☐	☐	☐	☐	☐	☐	yavaş	9
özgün	☐	☐	☐	☐	☐	☐	☐	geleneksel	10
engelleyici	☐	☐	☐	☐	☐	☐	☐	destekleyici	11
iyi	☐	☐	☐	☐	☐	☐	☐	kötü	12
karmaşık	☐	☐	☐	☐	☐	☐	☐	sade	13
itici	☐	☐	☐	☐	☐	☐	☐	cezbedici	14
alışıldık	☐	☐	☐	☐	☐	☐	☐	eşi görülmedik	15
hoşa gitmeyen	☐	☐	☐	☐	☐	☐	☐	hoşa giden	16
güvenli	☐	☐	☐	☐	☐	☐	☐	güvensiz	17
canlılık verici	☐	☐	☐	☐	☐	☐	☐	uyutucu	18
beklentileri karşılayan	☐	☐	☐	☐	☐	☐	☐	beklentileri karşılamayan	19
verimsiz	☐	☐	☐	☐	☐	☐	☐	verimli	20
açık	☐	☐	☐	☐	☐	☐	☐	kafa karıştırıcı	21
yararsız	☐	☐	☐	☐	☐	☐	☐	yararlı	22
derli toplu	☐	☐	☐	☐	☐	☐	☐	dağınık	23
çekici	☐	☐	☐	☐	☐	☐	☐	çekici değil	24
sempatik	☐	☐	☐	☐	☐	☐	☐	sempatik değil	25
tutucu	☐	☐	☐	☐	☐	☐	☐	yenilikçi	26

Değerlendirmeniz için teşekkür ederiz.

Appendix J. Focus Group Discussion Protocols

Odak Grup 1 Görüşme Protokolü
SUNUŞ
Hoş geldiniz Merhaba arkadaşlar, Yapılacak çalışma ile Tasarım için İngilizce öğretiminde çizgi roman ve interaktif çizgi roman kullanımına ilişkin olarak iletişim tasarımı öğrencilerinin görüşleri incelenmeye çalışılacaktır. Bu kapsamda araştırmanın problem cümlesini, "Tasarım için İngilizce öğretiminde çizgi roman ve interaktif çizgi roman kullanımına ilişkin olarak iletişim tasarımı öğrencilerinin görüşleri nelerdir?" sorusu oluşturmaktadır.
ÖRNEKLEM, KAPSAM VE VERİ YÖNETİMİ
Bilgilendirilmiş onam formunda da belirtildiği gibi sonuçlar yüksek lisans tezi ve ondan üretilecek araştırma makaleleri için kullanılacaktır. Çalışma kapsamındaki birinci odak grubun içerisinde yer aldığınız için bu görüşmeyi gerçekleştiriyoruz. Sonuçların analizinde, yorumlanmasında ya da aktarımında sizlerin isimlerinize yer vermeyeceğiz. Her biriniz için kullanacağımız kodlar ile değerlendirmeyi aktaracağız.
YÖNERGELER
Şimdi sizlerle yönergelerimizi paylaşıyorum: ● Unutmayın ki, doğru ya da yanlış cevap yok, sadece farklı bakış açıları var. ● Görüşmemizi kaydediyoruz ve her seferinde bir kişi söz alıyor. ● Başkalarıyla aynı fikirde olmanıza gerek yok ama dinlerken saygıyla dinlemeli ve karşı görüşlerinizi de bu doğrultuda vermeniz bu görüşmenin sağlıklı ilerleyebilmesi için uygun olacaktır. ● Söylemleriniz diğer üyeleri domine edecek ve yönlendirecek düzeyde ve üslupta olmamalıdır. ● Lütfen cep telefonunuzu sessize alın ya da kapatın. Eğer yapamıyorsanız ve bir çağrıya cevap vermeniz gerekiyorsa lütfen bunu olabildiğince sessiz yapın ve olabildiğince çabuk bize yeniden katılın.
YÖNTEM
Moderatör olarak görevim tartışmayı yönlendirmek olacak. Bu kapsamda, zamanlamayı yönetecek ve ihtiyaç halinde verilen cevaplar doğrultusunda görüşlerinizi daha iyi anlayabilmek adına aralara girerek bazı sorular soracağım. Şimdi herkes hazır ise odak grup görüşmemize başlayabiliriz.
Isınma sorumuz ile başlıyoruz: Favori bir çizgi romanınız var mı?
ARAŞTIRMA SORULARI
1.Bu ders kapsamında çizgi roman kullanmanın avantajları ve dezavantajları nelerdir? **2**.Bu ders kapsamında kullanılan çizgi roman mesleki dil becerilerinizin gelişimde sizlere nasıl bir öğrenme deneyimi sundu? **3.** Bu ders kapsamında kullanılan çizgi roman mesleki dil becerilerinizin gelişimine hangi

açılardan faydalı ya da faydasız oldu? **4.** Bu ders kapsamında kullanılan çizgi roman eğitsel çizgi romanlara karşı tutumunuzda ne gibi değişikliklere sebep oldu? **5.** Üniversite düzeyinde verilen tasarım eğitimlerinde mesleki bilgilerinizi geliştirmek adına çizgi romanlardan nasıl faydalanılabilir? Hangi dersleriniz eğitsel interaktif çizgi roman kullanımına uygun ya da değil? **6.**Bundan sonraki derslerimizde çizgi romana yer verilmesini ister misiniz? Neden?
Çıkış Sorusu:
7. Önemli bulduğunuz, değinmediğimiz veya eklemek istediğiniz başka noktalar var mı?
TEŞEKKÜR VE KAPANIŞ

Meral ŞENTÜRK

Odak Grup 2 Görüşme Protokolü

SUNUŞ

Hoş geldiniz

Merhaba arkadaşlar,

Yapılacak çalışma ile Tasarım için İngilizce öğretiminde çizgi roman ve interaktif çizgi roman kullanımına ilişkin olarak iletişim tasarımı öğrencilerinin görüşleri incelenmeye çalışılacaktır. Bu kapsamda araştırmanın problem cümlesini, "Tasarım için İngilizce öğretiminde çizgi roman ve interaktif çizgi roman kullanımına ilişkin olarak iletişim tasarımı öğrencilerinin görüşleri nelerdir?" sorusu oluşturmaktadır.

ÖRNEKLEM, KAPSAM VE VERİ YÖNETİMİ

Bilgilendirilmiş onam formunda da belirtildiği gibi sonuçlar yüksek lisans tezi ve ondan üretilecek araştırma makaleleri için kullanılacaktır. Çalışma kapsamındaki odak grubun içerisinde yer aldığınız için bu görüşmeyi gerçekleştiriyoruz. Sonuçların analizinde, yorumlanmasında ya da aktarımında sizlerin isimlerinize yer vermeyeceğiz. Her biriniz için kullanacağımız kodlar ile değerlendirmeyi aktaracağız.

YÖNERGELER

Şimdi sizlerle yönergelerimizi paylaşıyorum:

- Unutmayın ki, doğru ya da yanlış cevap yok, sadece farklı bakış açıları var.
- Görüşmemizi kaydediyoruz ve her seferinde bir kişi söz alıyor.
- Başkalarıyla aynı fikirde olmanıza gerek yok ama dinlerken saygıyla dinlemeli ve karşı görüşlerinizi de bu doğrultuda vermeniz bu görüşmenin sağlıklı ilerleyebilmesi için uygun olacaktır.
- Söylemleriniz diğer üyeleri domine edecek ve yönlendirecek düzeyde ve üslupta olmamalıdır.
- Lütfen cep telefonunuzu sessize alın ya da kapatın. Eğer yapamıyorsanız ve bir çağrıya cevap vermeniz gerekiyorsa lütfen bunu olabildiğince sessiz yapın ve olabildiğince çabuk bize yeniden katılın.

YÖNTEM

Moderatör olarak görevim tartışmayı yönlendirmek olacak. Bu kapsamda, zamanlamayı yönetecek ve ihtiyaç halinde verilen cevaplar doğrultusunda görüşlerinizi daha iyi anlayabilmek adına aralara girerek bazı sorular soracağım. Şimdi herkes hazır ise odak grup görüşmemize başlayabiliriz.

Isınma sorumuz ile başlıyoruz: Favori bir çizgi romanınız var mı?

ARAŞTIRMA SORULARI

1. Bu ders kapsamında interaktif çizgi roman kullanmanın avantajları ve dezavantajları nelerdir?

2. Bu ders kapsamında kullanılan interaktif çizgi roman mesleki dil becerilerinizin gelişimde sizlere nasıl bir öğrenme deneyimi sundu?

3. Bu ders kapsamında kullanılan interaktif çizgi roman mesleki dil becerilerinizin gelişimine hangi açılardan faydalı ya da faydasız oldu? **4.** Bu ders kapsamında kullanılan interaktif çizgi roman eğitsel çizgi romanlara karşı tutumunuzda ne gibi değişikliklere sebep oldu? **5.** Üniversite düzeyinde verilen tasarım eğitimlerinde mesleki bilgilerinizi geliştirmek adına interaktif çizgi romanlardan nasıl faydalanılabilir? Hangi dersleriniz eğitsel interaktif çizgi roman kullanımına uygun ya da değil? **6.** Bundan sonraki derslerimizde interaktif çizgi romana yer verilmesini ister misiniz? Neden?
Çıkış Sorusu:
7. Önemli bulduğunuz, değinmediğimiz veya eklemek istediğiniz başka noktalar var mı?
TEŞEKKÜR VE KAPANIŞ

Meral ŞENTÜRK

Appendix K. High-Fidelity Prototype of “Norm(s) of Design Language”- Excerpts fromChapter 1

DESIGNER the OBSCURE

ASKS

Norm(s) of Design: Key Issues Selected from Universal Design and Interaction Design



THE ULTIMATE DESIGN SENSEI

REPLIES

CHARACTERS

"Design Sensei" is a well-known and highly regarded design professor. It's not his success that stands out, but rather his striking resemblance to Donald Norman. He sees himself, Donald Norman, and Jakob Nielsen as the essential design trio.

All speech balloons have been reserved for this character.

"Designer the Obscure", a design student whose heart beats with a burning passion for comics , wants to create a captivating comic series that immerses readers in the world of design terminology; offering invaluable assistance to design students who may not have English as their first language.

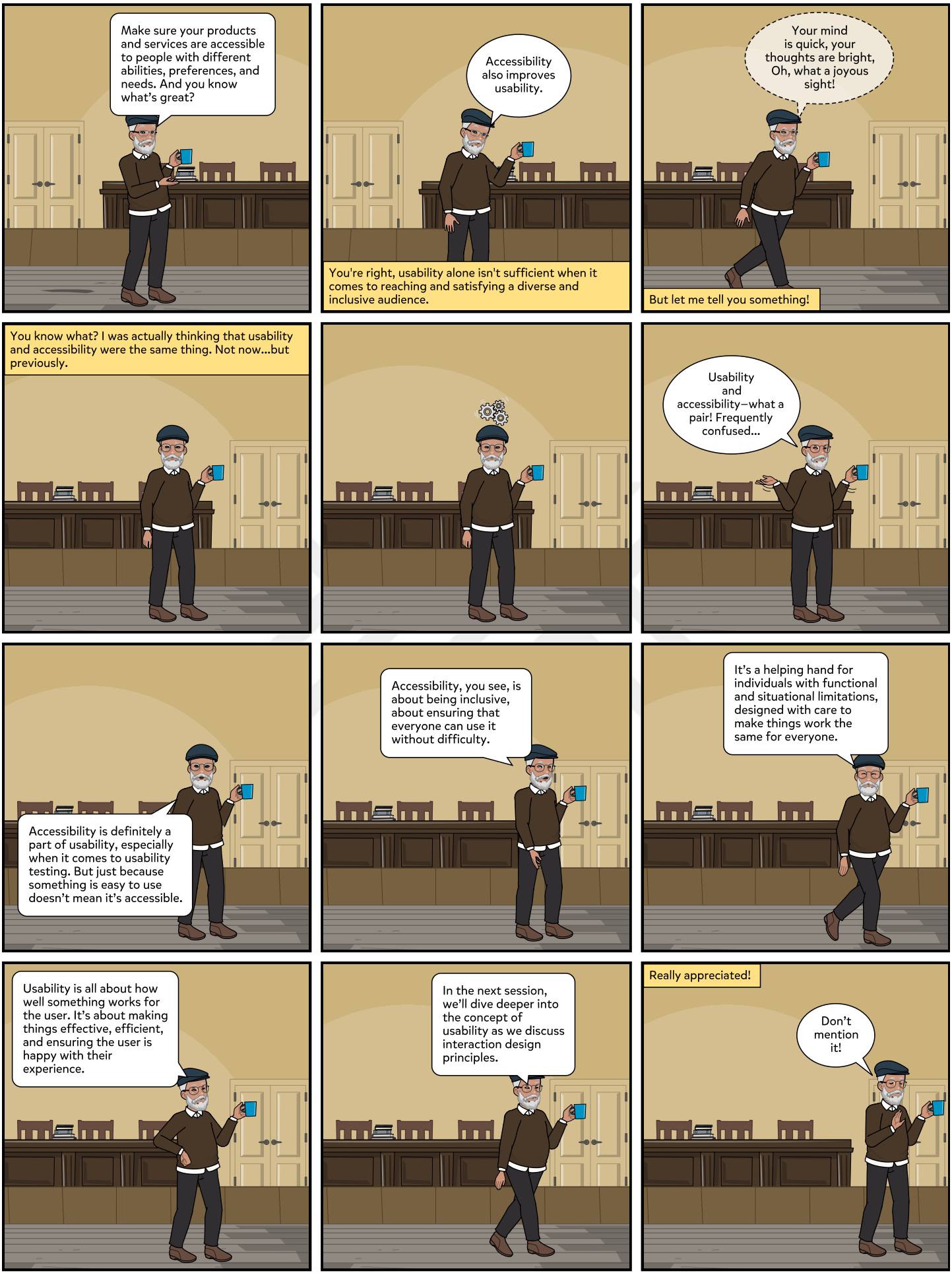
All captions have been reserved for the character.

Chapter 1

Half-baked Story of the Book

&

A Quick Look at Universal Design


Make sure your products and services are accessible to people with different abilities, preferences, and needs. And you know what's great?
Accessibility also improves usability.
You're right, usability alone isn't sufficient when it comes to reaching and satisfying a diverse and inclusive audience.
Your mind is quick, your thoughts are bright, Oh, what a joyous sight!
But let me tell you something!
You know what? I was actually thinking that usability and accessibility were the same thing. Not now...but previously.
Usability and accessibility—what a pair! Frequently confused...
Accessibility is definitely a part of usability, especially when it comes to usability testing. But just because something is easy to use doesn't mean it's accessible.
Accessibility, you see, is about being inclusive, about ensuring that everyone can use it without difficulty.
It's a helping hand for individuals with functional and situational limitations, designed with care to make things work the same for everyone.
Usability is all about how well something works for the user. It's about making things effective, efficient, and ensuring the user is happy with their experience.
In the next session, we'll dive deeper into the concept of usability as we discuss interaction design principles.
Really appreciated!
Don't mention it!

Appendix L. Final Design of "Norm(s) of Design Language" Chapter 1

DESIGNER the OBSCURE

ASKS

Norm(s) of Design: Key Issues Selected from Universal Design and Interaction Design



THE ULTIMATE DESIGN SENSEI

REPLIES

This comic project was supported
by the Research Fund of Yildiz
Technical University
[SYL-2024-6160]

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All captions have been reserved for the character.

Chapter 1

Half-baked Story of the Book

&

A Quick Look at Universal Design

One day, like a brave knight charging into battle, I gathered up my courage and sent an email to Design Sensei; seeking his approval for my project like any humble servant would seek the king's favor.

How strange, like a fish riding a bicycle!

So...You are planning to create comics for communication design students...It sounds cool!

Honestly, sir!

If you want to use my avatar, it needs my approval. So, let me see it -- and an example of its use -- first. OK?

Yes. I'm fully aware .This is exactly why I'm writing.

Do you have any ideas?

I honestly had no, sir!

Almost two months later, I finally submitted the current page as a sample. Can you guess what he said?

???

Let's do it!

Next, I started to think about the setting, and all of a sudden, I realized that a classroom would be a great place for the story.

Oh, wow, a class? How absolutely thrilling and groundbreaking.The setting is just sooo creative!

Yeah, totally! Because that's definitely what I meant.

So tell me sir, what about this? Is it better?

It is as creative as a canvas painted with vibrant colors, or as imaginative as a symphony composed by a masterful maestro.

I heard you sir! It's such an honor to know that you like it.

Oops, I forgot something! Hey, would you mind giving the opening scene a redesign before we dive in?

How come, sir? Where does the problem lie?

The CURTAINS...Universal Design covers color management and color blindness awareness. This involves generating visual media for everyone.

They are green, sorry! Monitors with color-blind simulators and modes can be incredibly helpful, right?

Certainly yes, but never take it for granted. In your design, at least the semantic impact of green curtains on users is minimal...

I see your point. Color management and color blindness awareness help us provide a consistent and satisfying experience for all users, regardless of their color vision.

Yes, bear this in mind. The most prevalent form of color blindness, deuteranopia, affects green light perception and protanopia red light perception. It's a functional limitation.

Okay, I will.

Functional limitations can be visual, auditory, physical, or cognitive.

I see.

By the way, would you like something to drink before the lecture starts?

I'm glad you finally asked!

Here you are sir. Enjoy your coffee.

With this cup as blue as the summer sky? You've no idea, do you?

Oh, I absolutely adore blue, sir. It's just the most thrilling and captivating color in the entire universe. Don't you like it? What's the problem?

Blue-yellow color blindness, also called tritanomaly, is the same as red-green color blindness; except it makes it hard to tell the difference between blue and yellow.

But, luckily for you, it doesn't interfere with anyone's ability to enjoy this comic online. Prick up your ears: Don't rely on color alone to convey meaning.

I see what you mean now.

Here are some points to keep in mind if you want to incorporate Universal Design principles into your work: Conduct USER RESEARCH.

With whom?

People with differing backgrounds, skills, and cultures...In this way, you will get a fuller picture of their different experiences and needs.

What else?

DEFINE INCLUSIVE PERSONAS.

How many?

It's not a matter of quantity.

Take into account age, ability, gender, race, ethnicity, and language. Make sure your personas cover a huge audience.

I will try to do my best. What's next?

MAKE ACCESSIBILITY A TOP PRIORITY.

Any tips?

Utilize Web Content Accessibility Guidelines (WCAG) and visit the website of Interaction Design Foundation to learn more about this.

I do have some familiarity with them.

Good for you!

I try to think of a wide range of people who might use my designs, including those of different genders, races, nationalities, linguistic backgrounds, and so on.

Also, users' attention spans, fatigue, and other factors should be taken into account.

These are situational limitatitons, which also include device limitations and constraining circumstances.

Then... designers should be like.... strategists.

Very much...A designer is expected to have a strategic mindset to see the big picture.

Just like me!

Exactly!

The next thing is FLEXIBILITY AND ADAPTABILITY

Those sound like personality traits.

Actually, you make a good point!

Do you seriously mean that?

Yes. Both the preferences and abilities of a user can change over time. And your design should be adaptable and flexible enough to keep up with user needs and preferences.

What exactly are we, "fortune tellers?"

Literally, no! Figuratively, yes!

We are just empathizers!

Yeah, highly empathic!

Anyway, let's move on to another step!

Alright sir!

TEST YOUR DESIGN WITH DIVERSE USERS.

Hmm, like the ones in the user survey or research?

Similarly, yes. Test your design among people with various skills, perspectives, and cultural backgrounds.

It's a good way to collect valuable feedback and to identify possible problems with usability.

I see. I need to collect as much feedback as possible. This information will also help me make adjustments to the design until it is accessible for everyone.

Yes, here the keyword is "until". Don't perform a single test prematurely!

You mean "iterative design".

You've surprised me. Good catch!

Thanks a million! I have ears like a hawk and I'm all ears.

You're clueless when it comes to accepting compliments.

Always remember that Universal Design is a journey of trial and error. So, keep your ear to the ground, measure the pulse of your design's impact, and tweak it according to the wisdom of the crowd.

Put the user's needs first and actively seek their feedback.

As a result, you will be able to gradually add more user-friendly and accessible features into your design.

Make sure your products and services are accessible to people with different abilities, preferences, and needs. And you know what's great?

Accessibility also improves usability.

You're right, usability alone isn't sufficient when it comes to reaching and satisfying a diverse and inclusive audience.

Your mind is quick, your thoughts are bright, Oh, what a joyous sight!

But let me tell you something!

You know what? I was actually thinking that usability and accessibility were the same thing. Not now...but previously.

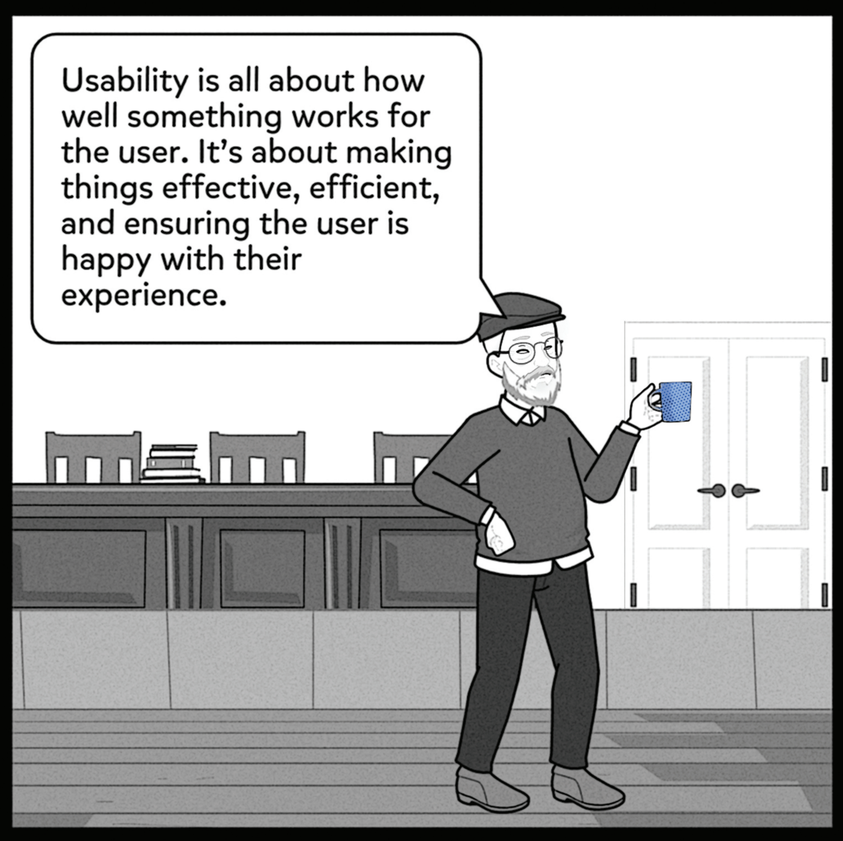



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Accessibility is definitely a part of usability, especially when it comes to usability testing. But just because something is easy to use doesn't mean it's accessible.


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It's a helping hand for individuals with functional and situational limitations, designed with care to make things work the same for everyone.


Usability is all about how well something works for the user. It's about making things effective, efficient, and ensuring the user is happy with their experience.


In the next session, we'll dive deeper into the concept of usability as we discuss interaction design principles.


Really appreciated!
Don't mention it!

Appendix M. Excerpts from Ongoing Design of Final Launch of NDL 1.0.





Appendix N. Physical Comic Group Interview Transcript

PC-INTERVIEW

Görüşmeye toplamda 9 öğrenci katılım sağlamıştır.

S9 *Ana dili Türkçe değildir.

Katılımcıların cevaplarının anlamsal bir değişime uğramaması adına dökümantasyon sürecinde ifadeler üzerinde mümkün oldukça az düzenleme yapılmıştır. Öte yandan, cevapların İngilizce'ye çevirilme sürecinde bu yöntem biraz farklılık göstererek anlamı aktarabilmek adına birebir çeviri yöntemi tam olarak izlenememiştir.

Bunların yanı sıra, karmaşık ve birbirini tekrar eden ifadeler toparlanmaya çalışılmıştır.

1	*Araştırmacı görüşme prokolünü okuduktan sonra ısınma sorusuyla görüşmeyi başlatır.* R: Hazırsanız başlıyorum. Önce bir ısınma sorusuyla başlayalım. Araştırma sorusundan önce. Favori çizgi romanınız var mı?
2	S1: Ten ten.
3	R: Ten ten'in nasıl telaffuz edildiğini biliyor musun?
4	S1:Tin tin
5	S2: Kaptan Swing.
6	R:Ne ile alakalı.
7	S2: Tipik Western. (*Öğrenci kısaca çizgi romandan bahseder*)
8	R: Var mı? Başka favori çizgi romanımız?
9	S3: Ben manga okuyorum.
10	R: Favorin var mı? Manga fanları çok.
11	S3:Ben Countryside okuyorum. Onun dışında Anne Kareninna'nın çizgi romanlarını okumuştum.
12	R: Countryside güzel. Nasıl okuyorsunuz mangaları?
13	S3:Tersten başlayıp okuyorsunuz. *(Katılımcı konu hakkında biraz daha konuştuktan sonra araştırmacı ilk görüşme sorusunu sorar.)*
14	R: Bu ders kapsamında çizgi roman kullanmanın avantajları ve dezavantajları nelerdir? Yanıtlamak isteyen el kaldırabilir.
15	S4: Olumlu ve avantajlı yönü şu olabilir, bir şeyi bize çok daha esprili bir şekilde anlatıyor ve

	görsellik var. Ve bu sıkıcılıktan uzaklaştıran bir etken. Ama çok bireysel okuma yaptığımız için bazen insanlar o bireysellikten sıkılıyor. Acaba beraber mi baksaydık dediğim zamanlar da oldu.
16	S3: Mesela çizgi roman okurken orada bir sürü bilgi oluyor ve o bilgilere sahnelerde görsel olarak göz önüne getirince bazı bilgiler benim aklıma geliyor. Görsel olduğu için hatırlamam çok daha kolay oluyor. Mesela affordence sorusu vardı, o soruyu gördüğüm zaman direkt aklıma onunla ilgili görsel aklıma gelmişti ve o şekilde hatırlayabilmiştim.
17	S5: Görsellik benim için de deneyimimi keyifli kıldı. Böyle zoraki bir şey yapıyor gibi hissetmedim. Herhangi bir şeyi öğrenmek zorundaymışım gibi hissetmedim. Ama belki ikili okusaydık öğretmeni ve öğrencileri başka biri seslendirseydi daha keyifli olabilirdi.
18	S1: Bence de hocam bu şekilde monotonluktan çıkartıyordu. Bir hikaye olduğu için aklımda daha fazla kaldı. Ama bazı yerlerde de arkadaşlarımın dediği gibi sıkmaya başladı. Belirli bir sayfa sayısından sonra kafamı kurcalamaya başladı.
19	R:O zaman biraz daha etkileşim mi beklediniz.
20	S1: Evet.
21	S6: Ben de böyle düşünüyorum hocam. Genel olarak bir konuyu hikayeleştirilmiş şekliyle gördüğünüz zaman çok daha kolay aklımda kalıyor . Ama tek başımıza bunu yaptığımız için onu devam ettirmesi bu noktada zor oluyor.
22	S5: Aslında bence sıkmasının sebebi şu. Resimlerin sınırlı olmasıydı. Resimlerin devamlı olarak belirli Resimler arasından seçilmiş olmasıydı. Eğer resimler daha çok olsaydı bence sıkmazdı.
23	S3: Orada bir konudan bahsediyor mesela. Bir konuda oyun dizaynından bahsediyor. Oyun dizaynıyla ilgili konuştuğu şeylerden örnekler gelseydi ve renk skalası belki biraz değişebilir. Çok classroom vibe'ı vermişti.
23	S5: Görseller tek düzeydi. Sanki çizgi roman gibi değildi. Açıkçası daha çok bir resim vardı ve üstünde baloncuklar yazı yazılmış gibiydi. Farklı bir görsel olmadığı için hepimiz aynı konuda aynı şeyi düşünüyorduk.
24	R: Bunu dezavantaj olarak alabiliriz. Okumada odaklanamama sebebi. İlgi kaybı
25	S7: Ben de diğer arkadaşlarım gibi resimlerin tek tük olmasından biraz sıkıldım. Yani aklıma tek bir sahne geliyor çizgi roman deyince.
26	S3: Mimikleri filan komikti aslında.
27	S8:Öğrenci de çizilseydi belki daha iyi olabilirdi.
26	S6: Başka sahneler vardı ama rengi bizi hep aynı gibi hissettirdi. Kahverengi ve siyah olması, sahnelerin ayırt edici özelliğini biraz almıştı.
27	S9: Ben çizgi roman ilk defa okudum. O yüzden çizgi roman okurken akışı biraz karıştırmışım

	çünkü alışık değildim. Okuduğumdan sonraki şeyin sıralaması noktasında biraz zorlandım. Çünkü sonrasında ne geleceğini bilemedim. Avantaj olarak şöyle çizgiler ve kelimeler sayesinde kaldığım yerleri daha hızlı fark ettim. Özellikle sahneler aklımda kaldı.
28	S2: Çizgi romanın renk paletinin değişebileceğini düşünüyorum. Stili güzeldi. Öğrenci interaktivitesi bence çok zayıftı. Farklı öğrenciler de olsaydı daha sınıf ortamı gibi olsaydı daha iyi olabilirdi.
29	R: Bu soruyu cevaplamayan yok değil mi? O zaman ikinci soruya geçiyoruz. Bu ders kapsamında Kullanılan çizgi roman mesleki dil becerilerinizin gelişiminde sizlere nasıl bir öğrenme deneyimi sundu?
30	S3: Şu an çok bir mesleki dil becerim yok ama bence bu yöntemle biraz daha geliştirdim.
31	S1: Yeni kelimeler öğrendim. Terimler öğrendim bu sayede.
32	S4: Dil terminolojimiz gelişti yani bildiğimiz bilmediğimiz şeyleri öğrendik. Şöyle söyleyeyim. Aslında devamlı olarak yaptığımız fakat ne yaptığımızı bilmediğimiz şeyleri ekledik dil terminolojimize.
33	S3: Dil açısından da bence iyiydi. Ben dil bilerek geldim ama terim konusunda bu ders gayet çeşitliydi. Ingilizce bilen birini bile zorlayan bir dersti.
34	R: Çok spesifik bir alan
35	S8: Kelimelerin ve terimlerin birbirleriyle nasıl kullanıldıklarını görmüş olduk. Çünkü bu yöntemle orada anlatılan şeyin hikaye eleştirilerek anlatılması bize aslında bu gördüğümüz şeyi gerçekte göreceğimiz şekilleriyle anlattı.
36	S7: Benim de kelimeleri öğrenmemde fayda sağladı. Çünkü çoğu kelimenin aslında karşılığını gerçekten ne olduğunu bilmiyoruz.
37	S6: Benim çizgi romanı görmeden önce öğrenme stilim çok ayrıktı. Sadece kelime çalışıyordum. Orada sadece belirli söz öbeklerine çalışıyordum. Ama çizgi romanla beraber cümlenin içine bazı eklerin bütün anlama değiştirebileceğini gördüm. Ve bu şekilde sadece tek bir şey öğreniyor gibi değil de bilgiyi direkt olarak ediniyormuş gibi hissettim. Benim için daha faydalı oldu.
38	S4: Aynı fikirdeyim aslında, ama bir şey eklemek istiyorum. Bunu video olarak izleseydik de aslında daha güzel olabilirdi. Yine okuyarak öğrendilk. Eğlenceli oldu aslında.
39	S2: Söylenecek her şeyi arkadaşlarım söylediler zaten. Benim ekstra dikkatimi bir şey çekmedi.
40	R: O zaman üçüncü soruya geçiyoruz. Bu ders kapsamında kullanılan çizgi roman mesleki dil becerilerinizin gelişiminde hangi açılardan faydalı ya da faydasız oldu?
41	S9:Mesela şey vardı. Biz çizgi roman okuduktan sonra kağıt veriyordunuz ya.Bunu çizgi romanı okumadan önce iyi cevaplayamıyordum ama okuduktan sonra daha iyi cevaplayabildim.

42 R: Var mı başka cevaplamak isteyen?

43 S3: Bana bir önceki soruyla çok benzer gibi geldi. *(Öğrenciler kendi aralarında soruyu kısa bir müddet tartışırlar . Araştırmacı soruyu açıklar ve yeniden sorar.)*

44 S7: X'in dediği gibi aslında önceden kendi kendime anlamaya çalışırdım. Mesela kelimeyi bilmiyorsam onu anlamaya çalışırım ve genelde ezber şeklinde olur. Ve bence bu çok da faydalı bir şey değil. Çünkü ezberlediğim zaman o kelimenin cümle içerisinde kullanım şeklini ve neyi ifade ettiğini tam anlamıyla öğrenemiyorum.

45 S6: Bana şey faydasız geldi sayfa düzenine baktığımızda sanırım 3-6-9 şeklindeydi ve küçüktü yazılar. Belki 4 veya 6 olsa yazılar ve görseller biraz daha büyük olsaydı daha eşit olabilirdi. Üçüncü sayfadan sonra beni bunaltmaya başladı. İlk üç sayfayı okurken biraz daha heyecanlıydım.

46 S4:Yazarken ve konuşurken kullandığım kelime çeşitliliğini çok arttırmış oldu çünkü orada kullanmış olduğumuz terminolojiyi sadece terminoloji olarak kullanmıyoruz. Genel her anlamda yardım edecek boyutta öğreniyoruz. Örneğin kendi konumuzda olmayan bir şeyi de bu sayede rahatlıkla öğrenebiliyoruz.Hangi konuya değinirse değinsin parçaları birleştirirerek anlamaya başladım.

47 S2:Çok fazla betimleme kullanılmış ve bu da mesleki anlamda bilmediğim örneklemeleri göstermiş oldu. Mesleki bağlamda da bildiğimiz ve öğreneceğimiz şeylerin çizgi romanla aslında nasıl kullanılacağını bir bağlam içinde görmüş olduk. Temel faydasının bu olduğunu düşünüyorum. Normalde o kelimelerin yazılı olduğu bir listeyi evet çalışıp öğrenebiliriz ama bunu tutarlı, mantıklı ve karşı tarafın iyi anlayabileceği bir cümle haline çevirmek için context içinde görmemiz gerekiyordu .Çizgi romanında bunu gayet iyi verdiğini düşünüyorum.

48 S1:Mesleki olarak terminolojiye az çok hakim olsam da terminolojiyi açıklamaya geldiğinde açıklayamıyordum. Atıyorum accesibility'nin ne olduğunu biliyordum ama açıklayamıyordum. Şu anda ise bu kelimeyi İngilizce açıklayabilecek kadar bile öğrendim. Genel olarak bütün terminolojiyi öğrendik. Mesleki dil açısından faydalı oldu.

49 S6: Ben cevabımı revize etmek istiyorum. Öğreten kişi sürekli soru soruyordu ve o soruyu cevaplamak için bir süre düşünmek gerekti. Eğer bu makale şeklinde olsaydı sürekli bilgi bilgi şeklinde verilseydi kitap okur gibi okurdum. Çizgi roman olması onun üstünde daha çok düşünmeme ve incelememe sebep oldu.

50 S8:Benim de farklı bir cevabım yok Daha öncesinde teoriye bu derece hakim değilken okuduğumuz bu üç haftalık süreç benim daha kolay öğrenmemi sağladı.

51 R:Dördüncü soruya geçebiliriz.Bu ders kapsamında kullanılan çizgi roman eğitsel çizgi romanlara karşı olan tutumunuzda ne gibi değişikliklere sebep oldu?

52 S1: Daha önceden çizgi roman okuduğum zaman. Gündelik hayatımda çok fazla çizgi roman okuyan biri değilim ama. Okuduğum zaman daha çok keyfi okumalar yapıyordum. Az önce belirttiğim gibi Ten Ten, polisiye gibi. Çizgi romanın daha çok bana mesleki hayatıma ve eğitim hayatıma bir şeyler katabileceğini görmüş oldum. Sadece keyfi bir amaç için değil eğitim amacıyla da çizgi roman kullanılabileceğini gördüm.

53 S5: Bence şöyle bir yönlendirme de yapılabilir. Diyelim bir konu var ve bu benim için çok komplike

	ve zorlanıyorum. Okumayı öğrenme amacıyla internete girdiğim zaman Google'a artık bu konuyla alakalı bir çizgi roman olup olmadığını da sorabilirim. Yani şöyle artık başka yöntemler de öğrenmek için sıkıcı olmaması için çizgi romanla öğrenme yöntemine başvurabilirim. Hatta belki de sadece sözel dersler de değil belki de sayısal derslerde özellikle lise düzeyinde de bu şekilde kullanılabilir.
54	S4: Özellikle yeni nesil için şunu söyleyebilirim. Dikkat süremiz gittikçe azalıyor ve insanlar artık daha fazla görsel şeylere yaklaşıyorlar. Hatta şöyle kitap okurken bile yandan herhangi bir ses olmadan herhangi bir uygulama açık olmadan kitabı okuyamıyorlar. Bu derece dikkat dağınıklığı oluştu. Bu sebeple de Youtube gibi platformlarda ders içerikli videolar daha çok izlenmeye başlandı. Eğer daha çok kullanılırsa yeni neslin daha çok ilgisini çeker.
55	S4: Bence de arkadaşıma katılıyorum. Düşünsenize Osmanlı tarihini böyle bir çizgi roman üzerinden öğrenmek çok faydalı olabilirdi.
56	S7: Ben arkadaşlarımın fikirlerine katılıyorum. Daha interaktif daha görsel ağırlıklı içerikler öğrenmemize katkı sağlıyor bence.
57	S3: Çizgi roman öğrenmeyi farklı bir şekilde deneyimlediği için bence de eğitsel açıdan kullanılması daha mantıklı. Yani şöyle, bu benim daha önce hiç aklımda olan bir şey değildi. Ben böyle bir şey olduğunu bilmiyordum. Kendi fikrim açısından söyleyecek olursam bende çok olumlu bir yer edindi.
58	S8: Ben de arkadaşım gibi böyle bir şey kullanılabileceğini bilmiyordum Özellikle eğitim alanında. Bence kullanımı çok faydalı olabilir.
59	S9: Hocam ben daha önce çizgi roman okumadığım için kendi açımdan keyifli olduğunu söyleyebilirim. Mesela eğitsel araçların görselleştirilmesi bence çok iyiydi. Görselleştirildiği zaman onu unutmuyorsun. O görselleri unutmayınca kelimeleri de unutmuyorsun.
60	S6: Benim de daha önce bir çizgi roman geçmişim yok. Özellikle eğitsel alanda. Ilk defa burada denedim. Bana da bu süreç olumlu yansıdı. Öğreneceğim şeyi daha toplu bir halde bana vermiş gibi oldu. Bu konuda iyiydi.
61	S1: Daha önce hiç eğitsel çizgi roman okumamıştım. Diğer arkadaşlarımın da söylediğim gibi. Daha çok keyfi çizgi romanlar okumuştum. Örneğin boş vakitlerimi doldurmak için okumuştum. Mesleki alanda hiç böyle bir şey kullanılacağını düşünmemiştim. Dediğimiz gibi çok eğlenceli bir süreç oluyor. Tasarımsal problemler vardı ama genel olarak eğitici çizgi romanlar için Konuşacak olursak çok mantıklı bir konsept olduğunu düşünüyorum. Bir çok farklı alanda da kullanılabileceğini düşünüyorum Öğreticilik açısından.
62	R: Üniversite düzeyinde verilen tasarım eğitimlerinde mesleki bilgilerinizi geliştirmek adına çizgi romanlardan nasıl faydalanabilirsiniz? Hangi dersleriniz eğitsel çizgi roman kullanımına uygun ya da değil?
63	S3:Enformasyon tasarımı dersi daha çok ilkelere dayalı bir ders olduğu için orada kullanılabilir. Ama bir tasarım tarihi dersi ya da sanat tarihi derslerinde çok bilgi yoğunluğu olduğu için sıkabilir. Yani şöyle teorik ağırlığı fazla olan derslerde Bence çok da kullanılmaya uygun değil. Ama hem teorik hem uygulamalı dersler için Özellikle sıkıcılığını kırmak için uygulanabilir. Akılda kalıcığını

	sağlayabilmek adına kullanılabilir.
64	S9: Bence ikisinde de kullanılabilir aslında. Çünkü teorik dersler genel olarak sıkıcı oluyor. Bazı derslerde anlatıldığı zaman uyuyakalıyoruz. O sebepten biraz daha görselleştirilerek anlatılırsa hem görseli unutmayız hem de daha verimli olur.
65	S5: Örneğin sanat tarihi, tasarım teorisi derslerini falan birinci sınıfta almıştık ve bence özellikle bu derslerde kullanılabilirdi. Hem tasarım açısından işimize yarardı hem de teori bakımından. Slayttan okunduğu zaman çok keyifli olmuyor. (Öğrenciler bir süre derslerdeki slaytları eleştiriler)
66	S9: Çizgi romana çevirsek biraz keyifli olabilir.
66	S4: Ben de ikisinin arasında bir denge olmalı. Teorik derste de uygulamalı derste de abes bir şey varsa ortada ya da sınıfın büyük bir çoğunun anlamadığı bir Şey varsa bunun çözülmesi adına Bundan da yararlanılabilir. Ama tüm dersin bu şekilde işlenmesi çok etkili olmaz. Bu şekilde olsa daha pratik olurdu. Çünkü bazı derslerimiz var, anlattığı şeyler spesifik olarak bazı yazılı şeylerle gösterilmesi gerekiyor. Ve ben slaytları gördüğüm anda uyuklamaya başlıyorum.
67	S5: Diyelim ki dersten çıktık, ders bitti ve yoldayız.Çok keyifli olur. Yoldayken bile açıp bakılabilir.
68	S4: Öyküleştirilebilir. Öyküleştirilen şeyler genelde insanların dikkatini daha çok çekiyor.
69	S5:Ve genel olarak bizim çoğu dersimiz buna uygun. Uygulamalı derslerin dışındakiler.
70	*Bazı öğrenciler uygulama derslerinin de uygun olduğunu belirtir.*
71	S7: Ben de şöyle düşünüyorum. Adobe Programları mesela görselleştirerek anlatılabilir. Zaten iki ders teorik bir şey oluyor. Daha sonra uygulamaya geçiyorsun. Programları görselleştirerek anlatmak daha eğlenceli olabilir gibi geldi bana.
72	S6: Ben de aynı şekilde düşünüyorum arkadaşlarımla. Bana da şöyle bir fikir verdi mesela Uygulanabilirlik temellerinde Ilk 3 hafta kullanıcı deneyimleri üzerine neleri sormalıyız? Nelere dikkat etmeliyiz gibi şeyler konuşmuştuk. Bu uygulamaları öğretirken ne düşünmemizle ilgili çizgi roman yine kullanılabilir. Ve aşamalarını da o çizgi roman üzerinden aktarsa. Aslında her yerde biraz kullanılabilir diye düşünüyorum. *(Araştırmacı biraz bekledikten sonra söz almayanlara yönelir.)*
73	S8: Bende aynılarını söyleyecektim arkadaşlarımla.
74	S1: Genel olarak arkadaşlarım her şeyi söylediler. Ekstra dikkatimi çeken bir şey olmadı.
75	R: Bundan sonraki derslerimizde çizgi romana yer verilmesini ister misiniz? Neden?
76	S9: Diyelim ki derste yeni bir kelime öğreneceğiz O zaman kullanılmasını isterim.
77	S5: Belki bu görsellerle değil ama daha eğlenceli çizgi romanlar şeklinde görsellerle kullanılmasını

	mutlaka isterim. Çok da keyifli olur.
78	S4: Ben bu kadar ana tema olarak değil de daha çok dersin bir materyali olarak kullanılmasını isterim. Tasarımsal boyutta bazı şeylerin değiştiği ve yapının düzenlendiği bir şekilde isterim. Her hafta güncellenen bir şekilde sunulan bir çizgi roman olmasını isterdim.
79	S1: Ben de genel olarak arkadaşlarıma katılıyorum. Sadece eklemek istediğim birkaç şey var. Genel olarak İngilizce noktasında takıldığımız için tabi ki herkesten bahsetmiyorum. Bir kısmımız için söyleyeyim. Bazı konularda bazı zamanlarda anlamamız çok zor oluyor. O anlarda bu ara konularda kullanılması anlaşılabilirlik konusunda dersi daha iyi yapacaktır. Sürekli değil ama ara ara belli zamanlarda kullanılması faydalı olur.
80	S2: Tasarımsal boyutta bazı değişiklikler olursa ve daha ilgi çekici hale getirilirse interaktifliği arttırılırsa her derste olmamak kaydıyla olabilir. Çünkü eğer her derste kullanılırsa sıkıcı olabilir.
81	S3: Ben de çoğu fikre katılıyorum hocam. Bence ara ara olmalı.
82:	S7:Bende aynısımı düşünüyorum. Görseller değişirse ara ara kullanılabilir.
83	R: Peki önemli bulduğunuz ve bizim değinmediğimiz başka konular var mı?
84	S3: Hocam dediğim gibi bazen sizin okuyup bizim takip ettiğimiz, bazen size arkadaşlarımız arasında sıralı ilerleyen bir şekilde olursa birazcık daha o ortama ait hissedebiliriz. Arkadaşlarımızla ve sizinle daha interaktif olduğumuz şekilde olursa kendimizi daha aktif ve etkileşimde hissedebiliriz diye düşünüyorum.
85	R:Bu derste bu materyali self-study materyal olarak kullandık.Çünkü biliyorsunuz benim teaching yapmam bağımsız bir değişkendi bu sefer sizin sonuçlarınız değişebilirdi. Teaching'in tek bir yöntemi yok.Bir sürü yöntem belirlenebilirdi.
86	S4: Manga okuyorum ve bunun için bazı uygulamalar var örneğin bir düğmeye basınca sayfayı geçiyor ve bunu bazen kısa yolları oluyor. Bunun gibi birşey yapılıp belki farklı eklentilerin ve özelliklerin eklenmesi. Bunu nasıl kağıttan çıkarırsak yani işitsel ve görsel olarak desteklenirse ve ne kadar simülatif olursa o derecede yeni nesle daha çok hitap edeceğini düşünüyorum.
87	S7:Benim ekstra söylemek istediğim birşey yok.
88	S6: Benim İngilizcem çok iyi değildi ve orta seviyede öğrenmeye çalışıyorum. O sebepten bana biraz yoğunlaştırılmış geldi. Konular üzerine düşünülmesi gerekilen şeylerdi. Sayfa içeriği yoğun olması belki biraz daha hafifletilebilirdi içerik. Bunlar yapıldığı takdirde derslerde sık sık kullanılabilirdi. İçerik olarak bir ders içeriği değil de iki üç ders içeriği vardı gibi. Zihnimde biraz yorgunluk uyandırdı nasıl bitecek. Okurken böyle hissediyordum. Bunlar düzenlenirse daha iyi olabilir.
89	S4:Belki de herkesin seviyesine uygun bir derecede olsa iyi olabilirdi. B1-B2-C1
90	*Araştırmacı ve öğrenciler bir süre şakalaştıktan sonra araştırmacı katılımcılara eklemek istedikleri başka birşey olup olmadığını sorar.*

91 S2:Başka birşey yok. Daha eğlenceli ve interaktif olursa.

92 *Araştırmacı katılımcılara teşekkür eder ve kaydı durdurarak görüşmeyi sonlandırır*.

Interactive Comic Group

Görüşmeye toplamda 10 öğrenci katılım sağlamıştır.

Katılımcıların cevaplarının anlamsal bir değişime uğramaması adına dökümantasyon sürecinde ifadeler üzerinde mümkün oldukça az düzenleme yapılmıştır. Öte yandan, cevapların İngilizce'ye çevirilme sürecinde bu yöntem biraz farklılık göstererek anlamı aktarabilmek adına birebir çeviri yöntemi tam olarak izlenememiştir.

1	*Araştırmacı görüşme prokolünü okuduktan sonra. Isınma sorusuyla görüşmeyi başlatır.* R:Öncelikle bir giriş sorusuyla başlayacağız.
2	S1Tamamdır.
3	R: Favori çizgi romanınız var mı?
4	S2:Benim var. Bir şey (Öğrenci ismi anımsayamaz) Jackson'nın seri haline getirilmiş bir roman serisinin çizgi romana çevrilmiş hali var ve mitolojiden bahsettiği için tasarımsal olarak çok güzel olduğunu söyleyebilirim. Aynı zamanda çok renkli ve evreni çok iyi yansıttığı için çok seviyorum.
5	R: Başka var mı favori çizgi romanı olan?
6	S3: Ben daha önce hiç çizgi roman okumadım nerdeyse.
7	R: Bunu söyleyen ikinci kişisin. Gerçekten çok enteresan. Diğer grupta da öyle ilk defa çizgi romanı o da bu derste okumuş.
8	S4:Manga falan da sayılır mı?
9	R: Sayılır tabii ki.
10	S4:O zaman Manga okudum.
11	R: Manga nasıl? Okuma tarzı nasıl?
12	S4: Tersten.
13	R: Evet. Biliyorsun soldan sağa ve sağdan sola okunduğu için. Bu bilgi de güzel bir bilgi. Teşekkürler. Var mı başka arkadaşlar?
14	S5: Ben de aynı şekilde sadece manga okudum.Yani çizgi romanlar biliyorum ama hiç seri

	şeklinde okuduğum olmadı.
15	R: Anladım.
16	S6: Ben bir ara Korecemi geliştirmek için webtoon okuyordum.
17	Meral: Webtoon'lar nasıl?
18	S6: Webtoon'lar güzel, güncel ama bazıları ücretli oluyor o sıkıntı.
19	R:Çok güzel arşivler. Tamam. Başlayalım mı? *(Araştırmacı biraz bekler ve çekingen olan bir öğrenciyi fark ederek soruyu bizzat ona da yönlendirir.)*
20	R: X senin var mı favori çizgi romanın?
21	S7:Benim var. Bir adaptasyon var adını hatırlayamadım şimdi Cumhuriyetin ilk yıllarında geçen bir kitaptı.
22	R: Şimdi başlıyoruz o zaman arkadaşlar. El kaldırıp söz alabilirsiniz veya ben sırayla söz verebilirim. Bu ders kapsamında interaktif çizgiroman kullanmanın avantajları ve dezavantajları nelerdir?
23	S5:Tasarım terminolojisi olarak daha akılda kalıcı olduğunu söyleyebilirim. Direkt o sayfaları ve neler söylediklerini anımsayabiliyorum. Bu benim için çok büyük bir avantaj oldu. Dezavantaj olarak da sanırım oradaki sayfa sayısını görememek ne zaman biteceğini görememek beni biraz sıktı ve endişelendirdi.
24	R: Teşekkürler. Başka?
25	S8:Eee, avantajlarından bahsecek olursak bazı derslerde terminoloji üzerine çalıştığımızda ya da bu yönde öğrenme yaptığımzıda odaklanması zor olabiliyor. Çünkü sıkıcı gelmeye başlayabiliyor çok fazla bilgi aktarımı olunca. Bunları anlamlandırmak da zor hale bürünebiliyor. Bu öğrenme biçimi açıkçası odaklanma süremi arttırdı ve hikayeleştirilmiş olma durumu beni daha içeride tuttu.Biraz daha bazı şeylerin cümle içerisinde kullanılmış olması kafamda bir şeylerin daha net bir biçimde oturmasına yardımcı oldu.Dezavantaj olarak da sanırım benim öğrenme biçimimle paralel olarak bir sınıfta olmamız ve bunu kalabalığın içinde bunu yapıyor olmak bazen odaklanmamı zorlaştırdı. Bunu biraz daha sakin bir ortamda yapmak ve not olmak bundan daha verimli olacakmış gibi. Genel olarak bence sınıf içinde verimliliği arttırdı.
26	R: Evet.
27	S4: Katılıyorum. Odak konusunda dikkati çok arttırdığını düşünüyorum çizgi roman kullanımının. Dezavantaj olarak da arkadışıma yine katılıyorum. Sayfa sayısının net olarak bilinmemesi olabilir.
28	S3: Avantaj olarak gerçekten benim de odaklanma süremi arttırdı. Tabi benim ingilizce seviyeme bağlı olarak ben çok anlamıyordum ama görselleştirilince daha çok anlayabilmeye başladım.Dezavantaj olarak yine aynı şekilde böyle sayfa şeklinde olsa sonunu görebilsek iyi olur.

	Belli bir yerden sonra o odak kaçıyor. Onun dışında odaklanma süresini kesinlikle arttırıyor.
30	S9: Hikayeleştirme olması bence de öğrenmeyi arttırıyor. Daha akılda kalıcı yapıyor ve görsel bir şeyler olması da dikkat çekiyor. Dezavataj olarak da ben de arkadaşlara katılıyorum. Ne zaman biteceğini bilmemek nerdeyim şuan nereye gidiyorum onu görememek beni birazcık endişelendirmişti.
31	S10:Avantaj olarak hikaye olması güzel. Bir şeyleri not olmak isteği oluyor ben de bilmediğim şeylere karşı. Bu benim için bir dezavantaj olabilir.
32	S2:Ben de özellikle sınıftansa evde bunu yaptığımda çok daha fazla verim aldığımı farkettim. Özellikle sınava çalışırken bunu baya kullandım. Çünkü terimler benim aklımda kalmıyordu. Bu yöntemle daha fazla öğrenebildim. Bir diyalog halinde olmak ve 3. Kişi olarak bizim de olması güzeldi. Sayfa sayısını görebilsek daha iyi olabilirdi.
33	S1:Sayfa sayısını görmek ve işte not almak, bilmediğimiz kelimelerin üstüne tıklayınca çıkması gibi şeyler olsa daha iyi olabilirdi diye düşünüyorum.
34	S7:Ben de arkadaşlarıma katılıyorum.
35	S6:Ben sayfa sayısına değil ama back tuşunu çok fazla kullandım diğer sayfalarla bir bütünlük sağlayabilmek adına. Ama bunu dışında özellikle bir şeyler yazarken ve çözerken vize kağıdında orada işlediğimiz bölümlerin çok daha fazla aklımda kaldığını ve düşünmeden ezberlemeden kendi kendime bunu biliyorum öğrenmiştim dedim.
36	R: Teşekkürler. Herkes cevap verdi mi bu soruya? O zaman ikinci soruya geçiyoruz. Bu ders kapsamında kullanılan interaktif çizgi roman mesleki dil becerilerinizin gelişiminde sizlere nasıl bir öğrenme deneyimi sundu?
37	S9: Biz genel olarak collocation listlerden çok fazla gidiyoruz ve bir kelimen in birden çok anlamı olabiliyor. Onu çizgi romanda okuyarak öğrenerek görünce daha akılda kalıcı oldu. Ya da daha önemli olanlar veya hangi kalıpların birlikte kullanılacağını görmek bunun üzerinde notlarla çalışmak kafamda daha iyi yer etmesini sağladı.
38	S3:Ben de bu konuda arkadışma katılıyorum. Bağlamda görmek belki sadece listelenmiş bir şekilde değil onu gerçekten okuyarak bağlamda tutarak görmek benim de hem kavramsal olarak hem de içerik olarak öğrenmemi hızlandırdı.
39	S4:Benim için normal derslerde teorik bir şey konuşmak zor oluyor. Özellikle İngilizce de bir kelimeyi kaçırınca bile anlam bozulabiliyor. Ama bunda görüp öğrenebilmek ve anlamadığımız bir yerde geriye gidebilmek benim için işe yaradı. Anlamadığımda geri dönüp devam edebildim. Normalde insan birine bir şey sorarken bile çekinebiliyor aynı soruyu sormaktan.
40	S6: Ben de aynı noktadayım. Hem yazılı olarak görüyor olmak hem de tekrar geri gidip onunla ilgili düşünebilmek iyi oluyor. Mesela bazen derslerde bir şey geliyor ve geçiyor. Onu geri alıp düşünme fırsatım olmuyor ya da o kaçırdığım şey kaçmış oluyor. Bu yöntem bana daha fazla alan tanıdı.
41	S2: Ben de genel olarak İnglizceyi duyarak değil okuyarak daha iyi anlıyorum. Hem okuyup hem

	geri alıp bir de görselle destekleyince kafamda daha net oturmasını sağladı.
42	S7:Hikayeleştirerek anlatılması ve kelimeyi gördüğümüzde anlamını bilmesem bile sahneler aklımda canlandı ve akılda kalıcı oldu.
43	R: Terminolojik açıdan yani.
44	S7: Görsellerle birlikte anlatılması oradaki kelimeyi bilmesem bile anlamama yardımcı oldu. Ama bu örnekler daha fazla olsa belki anlamada daha yardımcı olabilir.
45	S1:Kelimelerin hani ne için ve nasıl kullanıldıklarını görüyoruz ve buradan. Başka hangi kelimlerle birlikte kullanıldığını görünce Bir kelimenin nelerle bağlantılı olduğunu görüyorum. Böylelikle o kelimeyi daha iyi kavramama yardımcı oluyor. Arkadaşımın da dediği gibi Belki daha çok görsel olsaydı daha iyi olabilirdi.
46	S5: Çizgi roman şeklinde olması, bilmediğim kelimeleri hikaye şeklinde görerek bilmediğim zamanda bile o bağlamdan çıkarabildim.
47	R: Peki o zaman 3.soruya geçiyoruz. Bu ders kapsamında kullanılan interaktif çizgi roman mesleki dil becerilerinin gelişimine hangi açılardan faydalı oldu?
48	S3:Mesleki dile maruz kaldığımız için bu sayede biraz aşinalık oldu. Genel olarak daha ayırt edebilir hale geldim.
49	S7:Genel olarak derslerde teorik olarak gördüğümüz terimleri bir diyalog halinde görmek bunları normalde nasıl kullanacağımı gördüm.
50	S5: Mesleki terim kulağa biraz korkutucu gelen bir şey çünkü ne kapsamda öğrendiğine emin olamıyolsun. Bunu çizgi roman içinde görmek benim önmyargımı kırdı. Örneğin aslında basitmiş anlayabiliyormuşum dedim.
51	S2: Benim de bir şeyler okurken makale gibi şeylerde özgüven kazanmama sebep oldu. Şimdi bir şey okuduğumda ben bunu biliyordum diyerek daha çok yabancı kaynak kullanmaya başladım.
52	S8:Çizgi roman mesleki dil kullanıldığı kadar günlük dil de kullanılmıştı. Bu da okuma ve yazma alanında gelişmeye yardımcı bir şey olduğunu düşünüyorum.
53	S9: İlk haftalarda derslerde işlediğimiz o cümleler bana önyargı oluşturmuştu. Acaba okuyamayacak mıyım anlayamayacak mıyım hep diye. Çizgi roman onu daha eğlenceli hale getirdi.
54	S6:Ben de benzer bir yerdeyim. Benzer kelimeleri öğrenmeyi yazılı bir şeyden öğrenmek zorlaştırıyordu öğrenmemi. Daha günlük bir dil olması ve diyaloglar üzerinden geçmiş olması çok yorulmadan özgüvenli bir şekilde kelimeleri sindirmeme yardımcı oldu.
55	R:Bu ders kapsamında kullanılan çizgi roman, eğitsel çizgi romanlara karşı tutumunuzda ne gibi

değişiklerlere sebep oldu?

56 S3:Yani daha önce eğitsel çizgi roman hiç kullanmadım ama bu fırsatla beraber gördüm. Bu kadar akılda kalıcı olabileceğini düşünmüyordum. Bu konuda fikrim değişti.

57 S4:Mesela ben eğitsel çizgi roman diye bir şey olduğundan habersizdim. Dediğim gibi bence öğrenmemizi özellikle kavramlar noktasında çok kolaylaştırdı.

58 R: Eğitsel çizgi romanlara karşı tutumunuzla ilgili bir ölçek yapmıştık. Oradan sonra fikrim değişti diyen var mı?

59 S2: Benim fikrim değişti. Eskiden pek sıcak bakmıyordum. Ama şimdi gördüm ki daha faydalı bir hale geldi.

60 R: Üniversite düzeyinde verilen tasarım eğitimlerinin mesleki bilgilerinizi geliştimek adına interaktif çizgi romanlardan nasıl faydalanılabilinir? Hangi dersleriniz interaktif çizgi roman kullanımına uygun veya değil?

61 S10:Özellikle uygulamalı derslerimizde bunu kullanmak pek mümkün değil gibi. Ama teorik derslerimizde mesela kullanıbilirlik temelleri aslında bizim şuanda gördüğümüz tüm terimleri içeriyordu. Biz orada da anlamakta zorluk çekiyorduk. En başından bir çizgi romanımız olsaydı önceden terimleri öğrenebileceğimiz bir şey olsaydı daha iyi anlayabilirdik. Sanat tarihinde de kullanabilirdi. Örneğin gördüğümüz görseller bizim konuları daha iyi anlamamıza yardım ediyor ve bunu diğer teorik derslerde de yapsak daha iyi olabilirdi.

62 S6:Ben de katılıyorum. Bazı teorik derslerde interaktif çizgi roman kullanmak için iyi bir alan. Daha anlaşılabilir olabilirdi. Diğer derslerimizde de mekânsal/uzamsal bilgiler görüyoruz interaktif çizgi roman kullanımıyla bu bilgiler verilse daha iyi olabilir.

63 S9: Ben tam tersi düşünüyorum çünkü teorik dersler zaten bir şekilde o terminolojiye maruz kalmaktan ötürü akılda kalıcı hale geliyor ama uygulamalı derslerde öyle değil. Derste 10 dk geçtikten sonra unutuyoruz. Bu tarz şeylerle dersin sonunda veya eve gittiğimizde aklımızda canlanabiliyor.

64 S2: Teorik derslerde daha çok yardımcı olabileceğini düşünüyorum çünkü şu ana kadarki deneyimlerimden yola çıkarak genelde arkada bir slayt açık oluyor ve hoca oradan bize dersi anlatıyor. Burada benim dersteki konumum sürekli bir şeyleri not almaya çalışmak oluyor. Aslında bunu yapmak da benim öğrenmemi zorlaştıran bir durum. Çünkü belli bir yerden sonra kopuyorum ve notlara gidip baktığımdaysa soru işaretleriyle dolu oluyor. Böyle bir sistemle net bir kargaşadan kurtuluyorum ve öğrenme kapasitem artıyor.

65 S5: Bence derslerde kullanımı yararlı olabilir ama belli bir yerden sonra acaba dikkat kayar mı diye bir endişem var. Çünkü herkes kendi önündeki ekrana bakıyor ve kimin hangi sayfada olduğu belli olmuyor. Hocada bunu kontrol edemediği için biraz karmaşık geliyor. Bir moderatör olsa ve herkes aynı sayfada kalsa daha iyi olabilir.

66 R: Teknik olarak böyle bir şey mümkün. Böyle bir alt yapı da var.

67	S8: Mesela derste bunu yaparken bazılarımız daha erken bitirdi. Bazılarımız hâlâ devam ediyordu. Hani bu herkes aynı ekranda olsa ve bu kontrol edilebilir olsa daha iyi olur bence.
68	R: Peki bu moderatör illa bir sistem mi olmalı yoksa Bir hoca da olabilir mi?
69	S1: Bence online derslerde çok iyi olabilirdi. Çünkü zaten herkes kendi evinde ve herkes aynı şeye bakıyordu.
70	R: Bu bir sınıf aktivitesi olarak yapılsaydı beni moderatör eşliğinde yapılması daha iyi olurdu.
71	S1: Herkesin aynı anda bitiremeyeceği bir ortamda bunu kullanmak bence çok da uygun olmazdı.
72	S6: Bu konuştuklarımız benim aklıma bir şey getirdi. Biz burada çok kalabalık bir sınıf değiliz fakat daha kalabalık bir sınıf olsaydık belki daha kaotik olabilirdi öğrencilerin bir noktada kendi başına bir şeyler yapması. Bu da odaklanma süremizi negatif etkileyebilirdi. Ve hepimizin öğrenme ve odak süresi farklı olduğu için herkesin aynı yerde aynı anda bulunması çok da gerçekçi olmadığını düşünüyorum. Bazılarımızın 10 saniye ayırdığı bir metne bazıları çok daha fazla süre geçirmek isteyebilir. Bu da bence herkesin kendi süresinde ilerleyebileceği bir alan sağlıyor.
73	R: Örneğin X ödev verdi hoca.
74	S2: Hız böyle bir şeyle kullanıldığında çok yararlı olabilir çünkü zaten online derste herkes belli bir noktadan sonra kopuyor ve hani çoğumuz çıkıyoruz. Orada olmuyoruz eee ama böyle bir durumda bence çok yararlı olabilirdi.
75	S6: Bence de daha kalabalık sınıflarda böyle bir şey yapmak daha büyük bir kaosa sebep olabilir grup şeklinde yapılabilir. Belirli bir kişi sayısı olur ve onların başında da bir moderatör olursa tabii ki herkes yine kendi geçireceği süreyi kendisi belirler. Fakat başlarındaki kişiye de danışabilirler.
76	S9: Kalabalık sınıflarda mı derece acı şöyle bir şey var, arkadaşlarıma dediği gibi herkesin her şey için ayırdığı vakit farklı. Ve bence eş zamanlı yapılması herkes kötü etkileyebilecek bir şey olabilir. Çünkü herkesin odak süresi farklı. O yüzden teorik derslerde bu ek kaynak olarak sunulabilir.
77	S7: Ben biraz farklı düşünüyorum. Bu interaktif olarak kullanıldığı zaman bir öğretmenin slayttan anlatmasından daha farksız olmaz gibi geliyor. Örneğin video oyunlarından bir örnek vereyim. Bir seride Antik Yunan, Mısır' da ve 1000 li yıllar İngilteresini anlatan ücretsiz eklentiler ekledi. Bu yere girdiğiniz zaman o tarihi gerçekten görüyorsunuz. Ve bir şeylerin yapımının izleyerek o ana tanıklık edebiliyor olmak bence daha yararlı.
78	R:Arttırılmış gerçeklik ve video oyunu. Bir çizgi roman olarak düşünürsek mesela benzer olarak seslendirme gibi özellikler de vardı interaktif çizgi romanda.
79	S3: Bence teorik dersler için çok yararlı olabilir. Özellikle mesela bu dönem aldığımız teorik dersler de bir şeylerin görsel seçeneklerle anlatmak gibi şeyler var. Interaktif çizgi roman da böyle bir şey sunduğu için bence faydalı bir şey teorik dersler için.
80	R:Var mı bir şey eklemek isteyen? Bundan sonraki derslerimizde interaktif çizgi romanı ile

	ilerlenmesini ister misiniz?
81	S7: Ben isterim çünkü dediğim gibi kavramları terimleri hatırlamakta ve bunları kullanmakta zorluk yaşıyorum. O yüzden ben bunu kullanmak isterim.
82	S8: Ben de bunun kullanılmasını isterim çünkü terminolojik olarak hatırlayabilmek ve anlamlandırabilmek benim için çok zor. Bunun dışında aklıma tartışırken bir şey daha geldi. Mesela bizim kullandığımız uygulamalarda bazı yönergeler oluyor işte şuraya tıkla gibi interaktif çizgi romanı da buna entegre ederek sıkıcı Youtube videoları dışında daha adım adım aşamalı bir öğrenme yöntemi hazırlanabilir. Ben Youtube videosu izlerken uzun olduğu zaman özellikle çok sıkılıyorum.
83	S10: Açıkçası ben de kullanılmasını isterim. Bunu ders öncesi ve ders sonrası kullanımı beni nasıl etkiler diye düşünüyordum. Sanırım benim için dersten önce elimde böyle bir şeyin olması ve bunu daha derinlemesine anlayabilme fırsatımın olması daha iyi bir seçenek.
84	S4: Ben tam tersi düşünüyorum. Dersten önce verilmesinden ziyade dersten sonra verilmesi benim için çok daha verimli olur. Çünkü derste bir çok teorik şey görüyoruz. Ve bazıları aklımızda kalıyor bazıları ise kalmıyor. Dersten sonra alırsak bu materyali aklımızda kalanı da desteklemiş oluruz diye düşünüyorum.
85	S5: Bizim mesela çok fazla slayttan takip ettiğimiz dersler var. Mesela sadece ingilizce olarak gördüğümüz bir ders var ve o dersten aklımda hiçbir şey kalmıyor. Her bir slaytta bir önceki öğrendiğim şeyleri unutmuş olarak ilerliyorum. Bunun bir sebebi bence dersin içerisindeki ingilizce kavramlara hakim Olmamam Öbürü de ağzına kadar yazıyla dolu olması. Öncesi sonrası fark etmeksizin bir ek kaynağımız olsa işimiz belki de daha da kolaylaştırdı.
86	S6: Belki de hep kullanılmazdı ama böyle ara ara pekiştirmek için kullanacağımız bir şey olsaydı Daha iyi olabilir. Örneğin bir hafta normal ders bir hafta böyle kullanabileceğimiz ek bir kaynağın olması Pekiştirmek için faydalı olabilir.
87	S2: Ben de kullanılmasını isterim. Hem derslerden önce konuyu görmek, hazırlanmak hem de dersten sonra daha da iyi pekiştirmek adına güzel olabilir.
88	S1: Ben de isterim çünkü çizgi kanal sayesinde bilmediğim birçok terimi öğrendim. Eğer ben bunları slayttan veya herhangi bir yazılı kaynaktan görseydim, hiçbir şekilde aklında tutamazdım. Ve bence dikkate de çok tek bir yerde toplayan bir yöntemdi.
89	S9: Ben de ek kaynak olarak kullanılmasına katılıyorum ama bir ders normal bir ders böyle ilerlemesi gibi değil de örneğin 3 saatlik bir dersin 2 saatinde normal ders, bir saatinde ise böyle bir çizgi roman desteği sağlanabilir.
90	R: Peki bizim ders özelinde ne düşünürsünüz? Mesela haftaya ben yine bir çizgi romanla geleyim mi? Ben bunu kendi dersimde tekrar kullanmalı mıyım? Bir ek kaynak olarak da olabilir Ya da bir bölüm de olabilir. Ders içinde kullanımını ister misiniz?
91	S10: Ben ders içinde kullanımını seviyorum. Gerçek anlamda şeye katılıyorum. Hepimizin okuma şekilleri farklı ve hepimizin odaklanmayı sağlayabilmesi de farklı.

92 S2: Bir de sadece çizgi romanla okumak değil de bu karşılıklı bir şey olursa mesela. bir video yönlendirme olur. Bence bu yöntem çizgi roman akışına daha iyi olabilir. Bir de çizgi roman uygulaması yaparken. Eee derste işte sen yanlış yaptın sen doğru yaptın şeklinde değil de daha böyle yanlışı öğretici şekilde yaklaşım olursa daha iyi olur.

93 S4: Mesela belirli görsel örnekler sunulabilir. Biraz daha sorarak birazda oyun şeklinde olursa bence çok daha verimli olabilir.

94 R: Bunu bir prototip olarak düşünün. Farklı düşünen var mı?

95 S10: Ben de çok iyi olur, çünkü yanlışlarımız hani orada da görebiliriz. Ufak minik testler sayesinde.

96 S4: Bu testlerin ve interaktiflerin artması bence şey de önlüyor. Dalıp gittiğimiz zaman bizi uyarıcı bir bildirimle tekrardan oraya odaklanmamızı sağlarsa daha kullanışlı olabilir.

97 R: Değinmediğimiz ama aklınıza gelen interaktif çizgi romanla ilgili herhangi bir şey var mı? Eklemek istediğiniz?

98 S4: Dediğim gibi benim böyle bir uyarıcıya ihtiyacım oluyor bazen.

99 S6: Mesela küçüklüğümden beri interaktif bir şekilde bilgiye erişebiliyorum. Bunu tekrardan üniversite ortamında görüyor olmak benim aklıma ben bunu daha önce de gördüm fikrini getiriyor. Ya bu biraz kişisel bir deneyim oldu ama beynim böyle öğrendiğim bir öğrenim şekli vardı dememi sağladı.

100 R: Peki üniversite eğitim ve öğretiminde interaktif eğitimin yeri? Üniversite ortamıyla çok bağdaştıramadım bu öğrenme biçimini diyen var mı?

101 S5: Genel olarak benim üniversite öğrenmesine deneyimlediğim şey, kendi çabamla bireysel olarak öğrenmeyi çalışmak olduğu için. Bilmiyorum bu benim geçmişimde olan bir şey mi yoksa toplumun genel ön yargısı mı? Sanki çizgi romanlar konu hakkında çok fazla bilgi sahibi değilsen biraz daha fazla çocuklarla bağdaştırılır bir şey gibi. Gerçekte böyle olmamasına rağmen. Ve üniversite ortamında da çizgi romanın öğretici bir şekilde kullanılabiliyor olması da benim çok hoşuma gitti.

102 S3: Bence üniversiteyle interaktif öğrenme birbirine bağdaşmıyor. Örneğin, biz çoktan şanslıyız bölümümüzden dolayı. Genel olarak olan deneyimlerden çok uzakta interaktif çizgi roman deneyimi.

103 R: Var mı bir şey eklemek isteyen?

104 S1: Bence normalde uzak olmaması gereken fikirler ama üniversiteye geldiğimden beri hiç böyle bir şey görmedik. Ya bence bunu kullanmak çok daha verimli oluyor.

105 *(Araştırmacı bir süre bekler ve ardından teşekkür ederek görüşmeyi sonlandırır.)*

106 R: Bir şey eklemek isteyen yoksa görüşmeyi sonlandırıyorum.

Appendix P. Funding Acknowledgement

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