An Investigation of Research Designs in Digital Game-based Language Learning

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Article Info	ABSTRACT
	The present descriptive systematic review aimed to find out about the research designs adopted in the area of digital game-based language learning (DGBLL). To this end, the research designs of 33 articles focusing on DGBLL that have been published in journals indexed in Social Sciences Citation Index (SSCI) in the last five years have been investigated with regard to the main research designs, the data collection tools, and the data analysis techniques that were employed in the studies. Relevant codes and categories were identified via document analysis. The findings indicated that the quantitative design was the most widely preferred approach to research in DGBLL, which was followed by the mixed-method design and the qualitative design, respectively. Exploratory experimental studies and survey studies were the most commonly carried out research types. In terms of data collection tools, pre-tests and posttests, and questionnaires were the most prevalent quantitative tools whereas semi-structured interviews and open-ended questionnaire items were the most commonly preferred qualitative data collection tools. When it comes to data analysis, ANOVA-ANCOVA and t-tests were the most commonly conducted parametric tests and Wilcoxon-signed rank test was the most widely used non-parametric test. On the other hand, thematic analysis and content analysis were the most preferred qualitative data analysis techniques. It was concluded that DGBLL research focuses more on exploring whether there are significant effects of digital games on language learning than explaining how and why these potential effects might take place. While quantitative data-based research is widely accepted in the field of DGBLL, mixed methods and qualitative data-based methods have been deprived of a similar level of interest. Based on these findings, the study provides a glimpse into research methodologies in DGBLL and implications for research studies on DGBLL.

Dijital Oyun Tabanlı Dil Öğreniminde Araştırma Tasarımları Üzerine Bir İnceleme

Makale Bilgisi	ÖZET
	Mevcut betimsel sistematik derlem çalışması dijital oyun tabanlı dil öğrenimi (DGBLL) alanında benimsenen araştırma tasarımlarını ortaya çıkarmayı hedeflemiştir. Bu doğrultuda, Social Sciences Citation Index (SSCI) kapsamında taranan ve son beş yılda DGBLL üzerine yayımlanan 33 makalenin araştırma tasarımları temel araştırma tasarımları, veri toplama araçları ve veri analiz yöntemleri açısından incelenmiştir. İlgili kategoriler ve kodlar doküman analizi aracılığıyla tanımlanmış ve listelenmiştir. Bulgular DGBLL alanında nicel veriye dayalı tasarımların en yaygın şekilde tercih edilen araştırma yaklaşımları olduğunu ve bu yöntemlerin sırasıyla karma tasarım ve nitel tasarımlar tarafından takip edildiğini

göstermiştir. Keşfedici deneysel çalışmalar ve anket çalışmalarının bu alanda en fazla gerçekleştirilen araştırma türleri olduğu tespit edilmiştir. Veri toplama araçları açısından, nicel veriler kapsamında en yaygın araçlar deneysel çalışmalar kapsamında kullanılan ön test ve son test uygulamaları ile anketlerken, nitel veriler kapsamında ise görüşmeler ve açık uçlu anket soruları olmuştur. Veri analizine gelindiğinde ise ANOVA-ANCOVA ve t-test parametrik testlerde en fazla kullanılan veri analiz yöntemleri, Wilcoxon işaretli sıra testi ise parametrik olmayan testlerde en fazla kullanılan analiz yöntemi olmuştur. Diğer yandan, nitel verilerin analizinde ise en çok tematik analiz ve içerik analizi yöntemleri kullanılmıştır. DGBLL üzerine yapılan araştırmaların dijital oyunların dil öğrenimi üzerinde önemli etkilerinin olup olmadığını araştırmaya bu potansiyel etkilerin neden veya nasıl ortaya çıkabileceğini araştırmaktan daha fazla odaklandığı ortaya konmuştur. Nicel veriye dayalı araştırmalar DGBLL alanında yaygın bir şekilde kabul görmekteyken, karma yöntemler ve nitel veriye dayalı yöntemler ise benzer düzeyde bir ilgiden mahrum durumdadır. Bu bulgular ışığında çalışma DGBLL alanındaki çalışmalarla ilgili genel bir bakış sağlamakta ve DGBLL araştırmaları için çıkarımlarda bulunmaktadır.

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INTRODUCTION

Research designs adopted in certain fields have always been a fruitful area of research over the years. Researchers from various backgrounds have delved into the nature of research studies with regard to the approaches adopted towards academic inquiries due to distinct reasons. With their potential to guide researchers towards firmly established research methodologies in a certain field or subfield that have proven their stability in the area or to uncover approaches that might be adopted more to come up with more insights in that specific area, investigations of research methodology trends have provided considerable benefits to a number of researchers. Second or foreign language learning has also been an area where fruitful research studies have been conducted on research methodology trends.

Studies on research trends have been primarily dominated by investigations of research topics. Many studies on research trends in language teaching, such as those carried out by Kirmizi (2012), Hockly and Dudeney (2018), Latif (2018), and Almuhaimeed, (2022), put their primary focus on areas of interests rather than research methodologies. The question of what has been investigated has received more focus throughout the years compared to how these topics have been studied. Still, there has also been an interest in research methodology trends in language learning and related fields.

Researchers investigating research methodologies in language learning have revealed various approaches to conducting research. A variety of research designs are adopted in the field of English Language Teaching. The editorial of Nassaji (2017) on the articles published in the second issue of the year 2017 highlighted various aspects of the articles in the issue, among which was the inclusion of diverse methods adopted as part of the research designs of the articles. These involved quantitative, qualitative and mixed-method designs utilized to find out about distinct subject areas in the field. Throughout the years, various research studies have investigated specific research designs in the area of language learning or research designs of certain study types. In one of these studies, Lindstromberg (2016) investigated the application of inferential statistics in experimental and quasi-experimental studies that had been published in *Language Teaching Journal* over a period of 18 years. The study reported valuable insights into the research design of the studies from the preference of between-participant and within-participant designs to the type of analyses techniques that were used to interpret the outcomes. The findings indicated some negative aspects such as increased possibility of Type I errors due to complex ANOVA designs. But it also pointed out improvements over the years such as growing sample sizes and an increase in reporting effect sizes. Qualitative research designs in language teaching have also been subject to research inquiries. Richards (2009) probed into qualitative research trends in language teaching to find out potential for qualitative research in the area. In addition to the identification of the most prevalent qualitative research themes as of the year 2000, the study also dwelled on quality-related issues such as standards of research and checklists for meeting these standards. The study points out emerging guidelines as the most encouraging development for the improvement of qualitative research in second language teaching, but highlights the importance of being sensitive to emergent areas of research, as well.

Theses and dissertations have also been subject to scrutiny in terms of research design. In their study on research trends in master theses and doctoral dissertations in Türkiye over a period of 20 years, Atmaca and Ekşi (2023) found that the most commonly adopted research design was quantitative design for master theses and mixed-method design for doctoral dissertations. Descriptive, experimental and survey studies were the most commonly used quantitative design whereas case study, action research and conversation analysis were the most common designs for qualitative research for MA theses. For doctoral dissertations, the most commonly utilized designs for quantitative research were experimental, quasi-experimental and descriptive designs while the most frequently used designs for qualitative research were case study, action research, discourse analysis and corpus study. Similar to this, Öcel and Bergil (2023) found that mixed-methods design was the most common research design in doctoral

dissertations in Turkey while quantitative designs dominated master theses from 2019 to 2021. An earlier study by Özmen et. al. (2016) also noted mixed-method research design as the most prevalent approach to the overall methodology and the research questions and hypotheses in doctoral dissertations completed in Turkey from 2010 to 2014. The findings were also parallel to another earlier study by Şişman et al. (2019), who found that mixed-method approaches were more prevalent in ELT graduate theses and quantitative approaches were more common compared to qualitative approaches. Some researchers who focused on certain types of major approaches in detail, such as Zhang and Liu (2019) who focused on longitudinal mixed-methods design, also found similar results showing that longitudinal mixed-method research studies have shown a minor presence in the field and quantitative-driven research studies have been mainstream among longitudinal designs.

The employment of research methods in the context of Thai journals on language learning, however, was different compared to the Turkish context of graduate theses and dissertations. Investigating three Thai Scopus-indexed journals publishing on ELT from 2019 to 2021, Phoocharoensil (2022) identified that the most common research methods in ELT studies were quantitative approaches such as survey studies and experimental studies. These were followed by mixed-methods and qualitative designs. This study provided a further glimpse into the Thai context of research trends in ELT, which had previously been investigated by Jaroongkhongdach et al. (2011).

Instead of investigating the general scope of articles or theses on language learning, some researchers preferred to probe into the research trends in certain subfields of language learning. One such field is mobile language learning. In their study, Hwang and Fu (2019) sought to uncover the research trends in the research design of articles on mobile technology-assisted language learning from 2007 to 2016 and found that quantitative and mixed-methods designs saw a considerable increase in number from 2007-2011 period to 2012-2016.

Investigations into the prevalent designs adopted in articles are not limited to the area of second or foreign language learning. Many research studies have been conducted to uncover the general tendencies in the research designs of articles in other areas relevant to language learning, as well. Studies conducted by Bronkhorst (2013) on teacher education, Hashemi and Babaii (2013) on applied linguistics, Gopalan et al. (2020) on education, and Matos et al. (2023) on teaching and learning are some examples to these. These studies have been valuable for researchers to understand the general research design tendencies in their respective areas. Another example is Çiloğlu et al.'s (2021) investigation of articles focusing on augmented reality, which provided implications for the prevalence of research methodologies across different SSCI-indexed journals. An investigation of 394 articles revealed that the most preferred methodologies in the articles were quasi-experimental studies and descriptive studies. A similar study to this was conducted by Özalp and Kaymakci (2022) on postgraduate thesis on feedback. The researchers came to a similar conclusion that experimental and descriptive studies were the most commonly used research designs in a list of 83 graduate theses. Gökoğlu's (2021) findings regarding 95 graduate theses on engagement revealed that the most commonly preferred research methodologies in this area were correlational research for quantitative approaches and explanatory research for qualitative approaches. A more recent study by Banaz et al. (2023) revealed that the most common research methodology was qualitative approach with semi-structured interviews and content analysis as the most prevalently preferred data collection tools.

As can be seen from the studies on methodologies adopted in various areas relevant to second or foreign language learning, there has been considerable interest in investigating the approaches to research in these fields. These areas also included sub-fields under computer assisted language learning (CALL) such as mobile-assisted language learning (MALL). However, research methodologies in digital game-based language learning has not received the same attention (DGBLL). Most of the existing studies in the area put the emphasis on research trends in the form of topics and outcomes rather than research methodologies that are employed or do not delve into research methodologies with a multi-

layered evaluation of major components of research. In an effort to bridge this gap, the present study will be carried out to uncover the most commonly preferred methodologies in computer assisted language learning with the aim of providing insights about methodologies that have established themselves a firm ground in the area and methodologies that can be employed more by researchers. The undermentioned research questions were adopted in the study:

1) What are the most prevalent research methods in the articles focusing on DGBLL in terms of data types?
2) What are the most commonly used data collection tools in the articles focusing on DGBLL?
3) What are the most widespread data analysis techniques in the articles focusing on DGBLL?
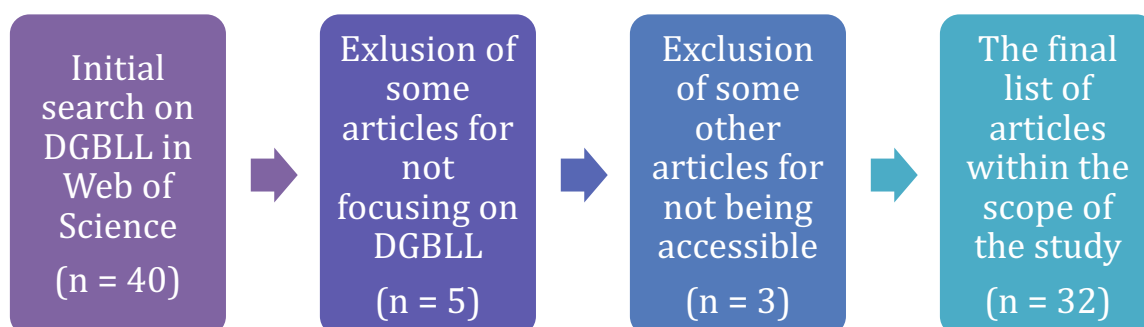
METHODOLOGY

The present study adopted a descriptive document analysis methodology to achieve its objectives. Creswell and Creswell (2017) describe document analysis as a qualitative research method which relies on examining existing documents to have insights about specific phenomena. Following the guidelines provided by the aforementioned researchers, the study aimed to find out about the methodologies, the data collection tools, and the data analysis techniques utilized in highly acclaimed CALL journals.

Data Collection

The dataset of the present study comprised research articles focusing on DGBLL published in widely acclaimed journals indexed in Social Sciences Citation Index (SSCI). The inclusion criteria identified for the articles in the study were the following: a) The article's main focus must be on *digital game-based language learning* and it must be available through a topical search with this exact key phrase, b) the articles focus must be on second or foreign language learning, c) the article must be published in the years 2018-2023, and d) the article must be accessible via Web of Science database. The articles meeting this criteria following an initial search were further investigated in detail to find out whether they did not meet any of the criteria (See Figure 1 for an overview of the procedure). An initial search with the aforementioned criteria resulted in 40 articles in total. Five of these articles were excluded from the target list since their focus was not on second or foreign language learning. An additional three articles were also excluded from the list since full papers of these studies were not available to the researcher. In conclusion, 32 articles were included in the final list of articles on DGBLL. These studies were published in the following journals: *Brain and Language*, *British Journal of Educational Technology*, *Computers & Education*, *Computer Assisted Language Learning*, *Education and Information Technologies*, *Educational Technology Research and Development*, *Frontiers in Psychology*, *Foreign Language Annals*, *HELIYON*, *Interactive Learning Environments*, *International Journal of Human-Computer Interaction*, *Language Learning and Technology*, *Modern Language Journal*, *Sustainability*, *PLOS ONE, RECALL*, and *System*.

Figure 1: Overview of the procedure for the inclusion and the exclusion of the articles

| Initial search on DGBLL in Web of Science (n = 40) | → | Exlusion of some articles for not focusing on DGBLL (n = 5) | → | Exclusion of some other articles for not being accessible (n = 3) | → | The final list of articles within the scope of the study (n = 32) |

Data Analysis

The present research study was mainly carried out by following the guidelines for qualitative data analysis provided by Creswell and Creswell (2017). First of all, the documents relevant to the research objective were chosen and involved in the scope of the study. This was followed by a thorough reading process in which the aim was to become familiar with the documents. Then, coding categories in accordance with the aims of the research were created. After this, an initial coding process was carried out by specifically focusing on the pre-determined target areas in the documents. The codes were re-evaluated after the end of the coding process to extract the most relevant information. At the end of the coding process, the results were interpreted based on the aims of the research. Finally, steps ensuring the reliability and the validity of the analysis were considered. The overall findings were evaluated by the categories and the frequency of the codes.

FINDINGS

Three main categories were identified as a result of the analysis. These were research design, data collection tools, and data analysis techniques. The total code frequency was 140. 32 of these were identified under research design, 47 were identified under data collection tools, and 61 were identified under data analysis techniques. The codes that emerged as a result of the analysis demonstrated the most prevalently adopted research methodologies, data collection tools and analysis techniques that were used in the target studies.

The first inquiry in the study was to find out the most prevalent methods employed in the research studies with regard to the type of data and the type of research (See Figure 2 for an overview of research designs based on data type in the articles). This inquiry was uncovered via the research design category and the codes identified under it. To start with, it should be noted that the overwhelming majority of the studies (28) focusing on DGBLL were empirical studies. Only five of the included research studies were conceptual papers where no empirical data collection was involved. These involved some theoretical papers and systematic reviews. The rest of the articles were all studies where empirical data collection took place. Among these articles, quantitative approach was the most dominant. Most of the studies in the review were quantitative empirical research studies with 19 studies involving only quantitative data. The mixed-method approach was the second most prevalent research methodology employed in the research papers with seven studies involving both quantitative and qualitative data. All of these mixed-method studies were explanatory in nature with quantitative data collection and analysis predating qualitative data collection and analysis. The least common empirical research approach in the studies focusing on DGBLL was the qualitative approach. Only two studies in the list were solely qualitative.

Figure 2: Research designs based on types of data

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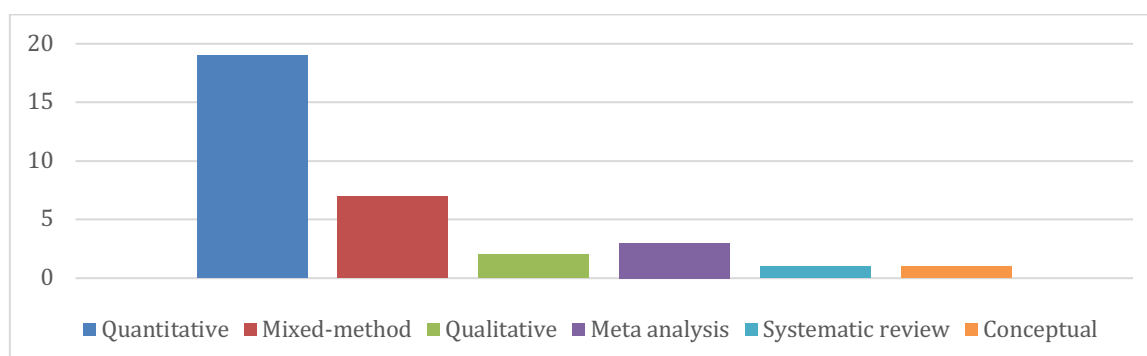
In the quantitative-data-driven papers, the most commonly employed design was the experimental design. Most of the studies in the review employed an experimental design with the implementation of a pre-test and a post-test. The content of the pre-test and the post-test differed from study to study, with the mostly investigated outcome being vocabulary gains from the pre-test to the post-test. A couple of studies also evaluated language skills performance such as speaking development, but the investigation of skills was less numerous compared to target language knowledge. Considering the high number of experimental studies, exploratory approach was quite prevalent in the target studies. The experimental design was followed by survey research. An important number of studies employed survey research, either in the form of the sole method employed in the study or as part of their mixed-method design through a questionnaire. The questionnaires employed in the studies were mostly oriented towards finding out about the attitudes of the participants towards using a game-based language learning system. Some of the questionnaires were in the form of a pre and post applications procedure where the attitudes of the participants were evaluated prior to and following the trial of the game-based learning system. Therefore, similar with the experimental studies, an exploratory approach prevailed in the studies employing the survey research design.

The mixed-method studies in the review were explanatory in nature. Quantitative data collection and analysis were conducted prior to qualitative data collection and analysis in these studies, mostly in the form of sequential designs. The initial tool for data collection in all mixed-method studies was a pre-test. All mixed-method studies involved in the review possessed a pre-test and post-test design. Other quantitative data-collection tools that were used alongside pre-tests and post-tests were questionnaires. Questionnaires were the most commonly used quantitative data collection tools alongside pre-tests and post-tests. Most of these questionnaires were also employed in a pre and post-design, as well. Qualitative data collection tools involved in the mixed-method designs were open-ended questionnaire items, journals, weblogs, and interviews. These tools were mainly aimed at coming up with explanations regarding the quantitative outcomes.

The second main focus of the study was to find out which data collection tools were most commonly employed as part of the studies centered around DGBLL (See figure 3 for an overview). This point of inquiry was clarified through the data collection tools category and the codes observed under it. The results indicated that pre-tests and post-tests were the most commonly utilized data collection tools in the studies. The vast majority of the articles utilized some kind of pre-tests and post-tests to answer the research questions involved with 19 studies involving this set of data collection tools. In eight of these studies, pre-tests and post-tests were the only data collection tool whereas in the remaining studies they were used alongside other quantitative or qualitative instruments. Following pre-tests and post-tests were questionnaires, which were utilized in 16 research studies. Compared to pre-tests and post-tests, questionnaires were only used as the sole data collection tool in three research studies. They were often used alongside other data collection tools, most notably with pre-tests and post-tests in nine studies.

Following the quantitative data collection tools, as the third most commonly used data collection tool, was the interview. As the most prevalent qualitative data collection tool that was found in the list of articles, interviews were used in six research studies. Interviews were not used as the sole data collection tool in any studies. They were mostly used alongside quantitative data collection tools in mixed-method studies. Only one study utilized an interview as part of a qualitatively-driven research design. Journals (researcher and participant), recordings (audio and video), and logs (weblogs and chatlogs) were the other data collection tools that were used in more than one research study in the list of articles. Journals were used in three papers while recordings and logs were utilized in two of the studies. Other data collection tools that were used as part of a single study were think-aloud protocol,

observation, messages, field notes and learning portfolios. The qualitative data collection tools were more diverse compared to the quantitative data collection tools despite being used less frequently as part of the studies focusing on DGBLL.

Figure 3: The most common data collection tool usage frequency in the target articles
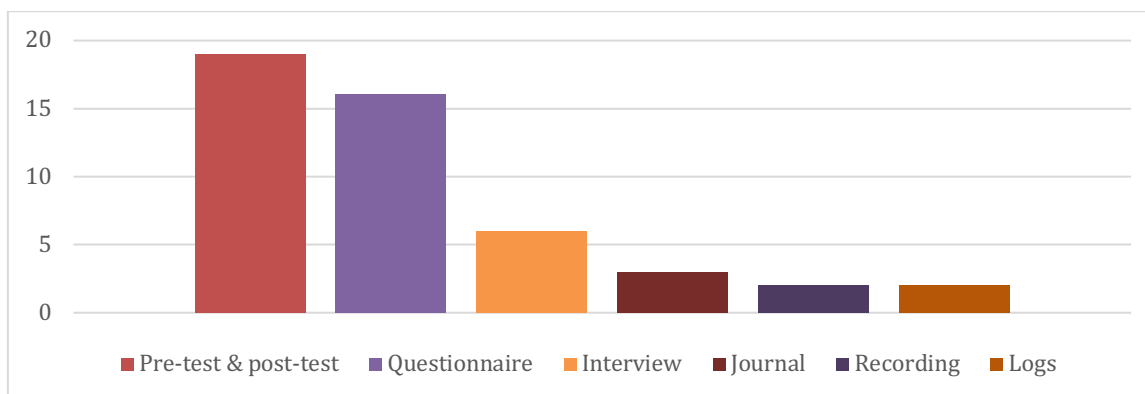
The third focus point in the study was to uncover the data analysis tools that were the most prevalently utilized in the target studies (See Figure 4 for an overview). This part of the investigation was laid out via the data analysis techniques category and the codes under it. To analyze the quantitative data, the data analysis technique that was the most commonly preferred by the researchers was analysis of variance (ANOVA). In 10 studies, some form of ANOVA was used, and, in some studies, more than one type of ANOVA was performed. In five studies, analysis of covariance (ANCOVA) was conducted, in four studies one-way ANOVA was used and in two studies repeated measures ANOVA was carried out. T-test was the second most commonly used parametric quantitative data analysis technique. T-test was used in eight research studies to find an answer to the research questions. The third most commonly employed data analysis technique was a non-parametric technique. Wilcoxon signed-rank test was used in two research studies to come to a conclusion regarding the aims of the study. In two of the studies, only descriptive statistics were used to evaluate the results. Some other quantitative data analysis techniques that were used as part of a single study were regression, robust variance estimation, Cohen's d, Friedman test, chi-square, root-mean square error of approximation, adjusted goodness-of-fit index, normed fit index and comparative fit index, sequential analysis, Mann-Whitney U test and graphical analysis. The quantitative data analysis techniques that were employed demonstrated more variety compared to the types of data collection tools used in the studies.

Figure 4: The most common types of data analysis techniques utilized in the studies
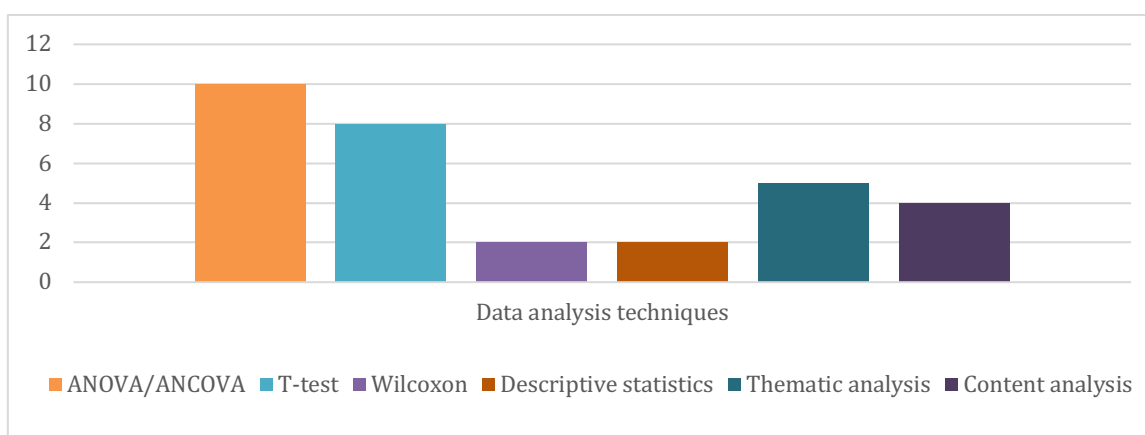
When it comes to qualitative data, the most commonly used data analysis technique was thematic analysis. In five studies, a thematic approach was taken to interpret the qualitative data. Thematic analysis was mostly preferred as part of the mixed-method research studies. The second most prevalent approach to qualitative data analysis was content analysis. Content analysis was used in four of the target research studies. Content analysis was also the main data analysis technique in qualitative-driven research studies. Some other qualitative data analysis techniques that were used as part of a single study were descriptive analysis, constant comparative method and behavioral sequence analysis. Compared of the variety of qualitative data collection tools, the qualitative data analysis techniques showed less diversity.

DISCUSSION

The first outcome of the study was that the quantitative approach was the most prevalent approach in studies focusing on DGBLL. This outcome corroborated the findings of Phoocharoensil (2022) who noted that the quantitative approach was the most prevalent approach to data in research studies in ELT. The findings were also in agreement with the results identified by Hwang and Fu (2019) in that the quantitative and mixed-method approaches were more widely adopted in research studies compared to the qualitative approach. There was parallelism with the present findings and the findings in other fields not directly but distantly related to language learning where the quantitative approach was the most dominant approach in research studies (Çiloğlu et al., 2021; Özalp & Kaymakci, 2022; Gökoğlu, 2021). On the other hand, there were also some studies whose findings were in contrast with the present findings. The present finding was not completely parallel with some studies in the field that probed into the methodologies adopted in graduate theses in the field of ELT since the mixed-method approach was the most commonly preferred approach in doctoral dissertations (Öcel &, Bergil, 2023; Özmen et. al., 2016; Şişman et al., 2019). The findings of the present study were only partially in parallelism with the findings of Atmaca and Ekşi (2023), who uncovered that the quantitative approach was more dominant in master's theses whereas the mixed-method approach was preferred more in doctoral dissertations in ELT. Although there are certain tendencies in the adoption of the methodologies for research in DGBLL, most major research types have been carried out in DGBLL throughout the target period, which is in parallelism with the findings of Nassaji (2017).

A comparison of the present findings and the existing findings in the literature reveals that the quantitative approach is more commonly preferred in studies providing implications for the research methodologies of articles whereas the mixed-method approach is more frequently adopted in graduate theses. This might be related to the possibility that master's theses and doctoral dissertations tend to comprise wider scopes compared to articles. In an effort to gain deeper insights regarding certain phenomena, writers of theses and dissertations may be inclined to opt for mixed-method research methodology. Similarly, writers of articles dealing with a large amount of data may decide to limit the number of data collection tools so as to meet the word limitation requirements of scientific journals.

The outcome clearly indicates that the quantitative approach has established itself as the most commonly preferred and accepted approach in DGBLL. It can be stated that an article reporting rich quantitative data on DGBLL has the potential to make it up to the highest rated journals on CALL. However, this does not necessarily mean that qualitative studies have a lower chance of being accepted by journals. The lower frequency of qualitative data preference may be related to countless other reasons from the potential predispositions of the researchers interested in DGBLL to the possibility that the area might still be in the phase of exploration rather than a phase of explanation. Whatever the reasons for the lack of qualitative data-driven studies are, DGBLL is certainly in need of more insights from qualitative data to explain why and how language learning takes place in digital games. In addition to this, although the mixed-method approach was adopted in more studies compared to qualitative papers,

it was still considerably less preferred compared to the quantitative approach. DGBLL can also benefit from more insights from an integration of multiple types of data, which could lead to a more comprehensive understanding of whether language learning takes place in digital games, and how and why it takes place as a whole.

Regarding the second point of inquiry, since majority of the studies surveyed in the present study showed a tendency towards using quantitative-only or quantitative-lead approaches, quantitative research designs and data collection tools were more prevalent in studies, especially in those with narrower scopes and shorter duration (Phoocharoensil, 2022; Hwang & Fu, 2019; Çiloğlu et al., 2021; Özalp & Kaymakci, 2022; Gökoğlu, 2021; Öcel &, Bergil, 2023; Özmen et. al., 2016; Şişman et al., 2019; Atmaca & Ekşi, 2023). According to the existing findings in the literature, experimental designs with a pre-test and post-test application and survey designs with questionnaire implementations were the most prevalent data collection tools employed in the studies in language learning. The present findings are also in parallelism with these findings. Experimental study and survey research designs are the most prevalent studies among the articles focusing on DGBLL. When it comes to qualitative tools, Banaz et al.'s (2023) findings indicated that semi-structured interviews were the most commonly used qualitative data collection tools. The present findings were also in agreement with this finding in that the most commonly employed qualitative data collection tools in DGBLL were also semi-structured interviews. Overall, the findings present considerable similarities with the existing literature on language learning.

The findings demonstrate that there is a widespread acceptance of well-designed experimental research studies and survey studies in the literature on DGBLL. Similarly, interviews with rich data potential have also gained significant acknowledgement in the field. Based on this, it can be stated that studies employing these data collection tools with well-established designs have the potential to be published in high-ranking journals featuring DGBLL as part of their content. It can also be thought that insights gathered via other well-designed quantitative and qualitative data collection tools might also be valued in the literature considering their relatively low presence. Quantitative and qualitative data collected via tools like observations and recordings may be employed independently or alongside other more accepted data collection tools to create more profound dimensions of understanding in DGBLL. The implementation of such tools and the data gathered through them may stand out among others considering their unique potential contributions to the field.

When it comes to the third point of inquiry, the findings demonstrated that the most common quantitative data analysis techniques were ANOVA-ANCOVA and t-test for parametric datasets and Wilcoxon signed-rank test for non-parametric datasets. There were also some studies reporting only descriptive data. The outcome was expected considering the prevalence of quantitative-driven studies in the target article list. The repeated measures design received considerable attention from the researchers in pre-test post-test designs whereas one-way ANOVA, t-test and Wilcoxon signed-rank test were mostly utilized for other one-time instrument applications. In the qualitative side, the most commonly used data analysis techniques were thematic analysis and content analysis. In mixed-method studies thematic analysis was preferred more whereas in qualitative-only studies content analysis was the more opted choice. The findings, similar with the previous point of inquiries, mostly in parallelism with the existing findings in the literature in that relatively short-term studies demonstrated more use of quantitative-only data analysis, whereas relatively longer-term studies had a tendency to involve both data analysis types (Çiloğlu et al., 2021; Gökoğlu, 2021; Özalp & Kaymakci, 2022). Qualitative data analysis techniques, on the other hand, were less frequently used in the studies as a whole. An additional point of consideration is Lindstromberg's (2016) warning on Type I errors due to complex ANOVA designs, which is certainly applicable to the research studies in DGBLL.

Based on the findings, it can be stated that well-established quantitative data analysis techniques such as ANOVA, t-test and Wilcoxon signed-rank test have received considerable acceptance in high-

ranking journals publishing articles on DGBLL. Therefore, it can be stated that studies involving a well-designed system of analysis using these data analysis techniques have a potential to get a positive reception from these journals. In addition to that, the use of qualitative data analysis techniques like content analysis and thematic analysis, along with or independently as part of thorough qualitative data, can increase the likelihood of acceptance from these journals. The findings indicate that there is especially a need for deeper insights into DGBLL through well-analyzed qualitative data, which may provide chances studies to receive a warm reception for journals that are aware of this situation.

The present study was subject to certain limitations. First of all, the study was not carried out with a considerably high number of articles. With a higher number of articles, there could have been a more profound understanding of the methodologies of articles focusing on DGBLL. Further research studies can be conducted to widen the scope of the study by including more scientific indices to cover more articles or other scholarly works such as conference proceedings or book chapters. In addition to that, the target period can be increased from five years to 10 or more years to have access to a higher number of articles covering a longer period of time. Secondly, the study was carried out as a descriptive systematic review with the purpose of portraying the methodologies adopted in DGBLL articles. Further research studies can take the form of other reviews such as a meta-analysis to delve deeper into the findings of the studies through the various methodologies employed in these. A final limitation is the classification of DGBLL studies. DGBLL studies feature various types of games. One example is the difference between serious games and commercial games. Further research studies can involve more categories to come up with a list of target articles and strive to understand the methodologies employed in different types of games.

CONCLUSION

Based on the findings, it is clear that researchers focusing on DGBLL have made considerable efforts to explore whether DGBLL leads to significant gains in terms of language learning. A substantial number of studies published in high-ranking journals have strived to find out the potential language learning benefits of DGBLL. Naturally, a significant number of quantitative data collection tools and analysis techniques have been conducted to find an answer to various research questions. In view of this, it can be stated that exploring the effects of DGBLL through well-designed quantitative approaches holds good potential for publication in high-ranking CALL journals. On the other hand, considering the lack of focus, it can be noted that there needs to be more studies focusing on why language learning takes place or how it does through the implementation of qualitative research or the integration of qualitative data into quantitative data in order to have deeper insights into game-based language learning. This need for focus may also create an opportunity for researchers coming up with well-established qualitative research designs in DGBLL for publication in high-ranking journals featuring articles on DGBLL.

Ethical approval

The study does not require an ethical approval since it was carried out as a review of articles.

Conflict of Interest

There is no conflict of interest in the present study.

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