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Revisiting the dichotomy between qualitative and quantitative research: Mixed-method designs in applied linguistics

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Abstract

Over the past decade, mixed methods research has gained particular attention in social and behavioral research as a considerable number of studies investigated theoretical and methodological aspects of conducting mixed methods research. In applied linguistics, however, mixed methods research is a new approach and little research exists on theoretical and methodological issues related to mixed-method designs. The present study has explored the research designs in which qualitative and quantitative components were combined in the field of applied linguistics. A qualitative analysis of 205 research articles published in seven peer reviewed applied linguistics journals over a period of 14 years revealed that two major

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categories of mixed-method designs were used in the studies (i.e., sequential and concurrent). Also, subcategories similar to those used in social research emerged in a good number of studies (i.e., triangulation, embedded designs, exploratory designs, explanatory designs). However, the findings further indicated that applied linguistics researchers did not draw on the previously known designs from social research and adopted a pragmatic approach to integrating qualitative and quantitative strands. The findings of this study may help us develop an enhanced understanding of how mixing can be systematically utilized in applied linguistics research.
Keywords: mixed methods research, mixed-method designs, qualitative, quantitative, applied linguistics

1. Introduction

Research in applied linguistics has undergone challenges as the field has seen decades of empirical work; and it is now more than two decades that "growing importance" has been "placed on research in second and foreign language teaching and learning" (Brown & Rodgers, 2002, p. xi). As with the social sciences, one major challenge for applied linguistics researchers has been the divide between qualitative and quantitative research that, in a good number of contexts, has led to the division of researchers into two differently oriented camps (i.e., qualitative researchers and quantitative researchers). In this regard, as Newman and Benz (1998) pointed out, there have been serious debates and controversies on the nature of qualitative and quantitative approaches since the early 1980s "as though one or the other should eventually emerge as superior" (p. xi). More recently, however, the dichotomy seems to have been revisited (Newman & Benz, 1998; Ridenour & Newman, 2008) and mixing the two approaches has become many social researchers' concern (e.g., Collins, Onwuegbuzie, & Jiao, 2006, 2007; Creswell, 2008; Greene

& Caracelli, 1997; Tashakkori & Teddlie, 1998, 2003, 2008, to name a few).

Mixed methods research has been introduced and used as a powerful method in different fields of inquiry such as education (Arnon & Reichel, 2009; Gorard with Taylor, 2004; Igo, Kiewra, & Bruning, 2008; Jang, McDougall, Pollen, Herbert, & Russell, 2008; Scott & Sutton, 2009). Following this new line of research, the present study seeks to explore the mixed-method designs in the field of applied linguistics. Although the nature and prevalence of qualitative and quantitative methods in applied linguistics have already been investigated (Benson, Chik, Gao, Huang, & Wang, 2009; Davis, 1995; Lazaraton, 1995, 2000, 2002, 2005; Norton, 1995), little research has addressed the integration of the two methods. Unlike studies in the social and behavioral sciences, it appears that applied linguistics research has not yet applied mixed methods as an independent approach; nor has it explored theoretical and practical issues related to mixing qualitative and quantitative methods (see Dörnyei, 2007). Therefore it seems that our understanding of mixed methods research in the field is yet to be developed and, to this purpose, serious and comprehensive research is a necessity.

The purpose of the present study, thus, was to investigate the nature of mixed-method research designs in the field of applied linguistics. To this purpose the study addressed the following research question: What kinds of research designs are used when mixing is utilized in applied linguistics research?

The significance of the study lies in the value of understanding the nature of mixed methods research as a new and growing trend in applied linguistics. Theoretically, this study addresses literature on mixed methods research and introduces the most important models that have been recently presented in social science research. Practically, the study investigates methodological issues related to combining qualitative and quantitative methods at the level of design. These methodological issues may provide a clearer picture

for applied linguistics researchers in terms of realizing mixed methods research in practice.

2. Review of Literature

2.1 Revisiting the Dichotomy between Qualitative and Quantitative Research

Newman and Benz (1998) and Ridenour and Newman (2008) rejected the dichotomy between qualitative and quantitative approaches and attempted to realize the two on an interactive continuum. They believe that this is a "false dichotomy" because "all behavioral research is made up of qualitative and quantitative constructs" and that "conceptualizing the dichotomy … is not consistent with a coherent philosophy of science . . ." (Newman & Benz, 1998, p. 9).

Greene and Caracelli (1997) analyzed and revisited the dichotomy between interpretivist and postpositivist paradigms. They criticized the extremist views of these two approaches and suggested a "balanced, reciprocal relationship between philosophy and methodology" (Greene & Caracelli, 1997, p. 12).

Johnson (2008) emphasized the significance of the dialectic approach. By making reference to the concept of "commensurability validity" (Onwuegbuzie & Johnson, 2006), Johnson (2008) noted that moving back and forth between qualitative and quantitative methods would enhance the researchers' "cross-paradigmatic understanding" (p. 203). Ontologically, Johnson (2008) advocated a pluralistic perspective and recommended that researchers accept and appreciate the existence of "multiple objects" and multiple realities (p. 204). Epistemologically, he advocated acceptance and use of "multiple standpoints and strategies" (p. 203). From a methodological point of view, he provided argument in support of recognition and utilization of "multiple methods" by the researchers (p. 205).

Patton's (2002) treatment of the dichotomy is very illuminating. He pointed out that "in real-world practice, methods can be separated from the epistemology out of which they have emerged" (Patton, 2002, p. 136). Patton (2002, p. 72) argued for the value of pragmatism and emphasized that "being pragmatic allows one to eschew methodological orthodoxy in favor of methodological appropriateness as the primary criterion for judging methodological quality, recognizing that different methods are appropriate for different situations."

According to the above arguments, using both qualitative and quantitative methods in a program of inquiry would help the researcher develop a better understanding of the phenomenon under study. The problem of incommensurable philosophical assumptions behind the two approaches would not then be of much importance as the practical value of mixing is evident.

If researchers agree that qualitative and quantitative research (although influenced by different paradigms) could be integrated to contribute to research in the social and human sciences, the next question would be: "What is mixed methods research?"

2.2 Definition of Mixed Methods Research

Bergman (2008, p. 1) defines mixed methods research as "the combination of at least one qualitative and at least one quantitative component in a single research project or program." Mixed methods research is the result of the "evolution" from mono-method research (Tashakkori & Teddlie, 1998). According to Tashakkori and Teddlie (1998), there are two stages involved in the evolution: from the 1960s to the 1980s (a shift to mixed methods from the epistemological and ontological weaknesses of qualitative and quantitative approaches); from the 1990s onward (integration of qualitative and quantitative approaches for establishing a mixed model of research). However, as Bergman (2008, p. 3) argued, "any development in mixed methods will not necessarily come

from developments in mono method research," and this would actually highlight the self-sufficient nature of mixed methods research as an independent mode of inquiry. Along similar lines, it would be simplistic to assume that doing both qualitative and quantitative research would mean the same as utilizing mixed methods research. Bryman (2008, p. 98) confirms this by noting that "conducting both quantitative and qualitative research doesn't mean that they are being integrated or mixed." The quality of integration depends on the degree of integration of the methods at different stages of the study (see Bryman, 2008).

2.3 Research on Mixing Methods

The social sciences have seen increasing use of mixed methodology in recent years. The following is a selective review of a number of notable studies on mixed research:

Bryman (2007) found a variety of possible barriers to the integration of findings from mixed methods research. He suggested that the process of developing articles based on mixed methods design deserves more attention because the findings identified factors that impeded "the ability of mixed methods researchers to bring together the quantitative and qualitative results of their projects" (Bryman, 2007, p. 20).

Concerned with paradigmatic problems at the epistemological and ontological levels and also methodological considerations in mixing, Morgan (2007) identified several methodological issues for integrating qualitative and quantitative approaches and proposed that a "pragmatic approach" needs to be used as a new paradigm for mixing methods in the social sciences, taking into account methodological issues rather than "metaphysical concerns" (Morgan, 2007, p. 48).

Further, Denscombe (2008) argued that mixed methods approach emerged as a "third paradigm" in social research. Denscombe (2008, p. 270) made an argument for the necessity of "a vision of research paradigm" that takes into account "variations and inconsistencies" in the mixed methods approach, and

introduced the concept of "communities of practice" as a basis for understanding the new paradigm. Denscombe (2008, p. 279) argued that this model "is well placed to deal with the fact that decisions about the use of a mixed methods approach will be shaped by a socialization process involving the influence of peers."

Greene (2008) investigated the value of mixed methods inquiry in the social sciences with regard to four major domains: "philosophy, methodology, practical guidelines, and sociopolitical commitments" (p. 7). In her investigation, Greene (2008) identified key design dimensions of mixed methods research and also addressed the neglected design dimensions like characteristics of methods, the nature of mixing, and the relationship between research method, research purpose and research design.

Hall and Howard (2008) presented an alternative mixed methods approach by integrating strengths of "typological and systemic" approaches in a coherent construct. Through using mixed methods in a "randomized controlled trial," Hall and Howard (2008, p. 248) discussed the practical application of their alternative approach by focusing on a number of core principles such as "synergy, equal value, the ideology of difference, and the relationship of the researcher(s) with the study design" (p. 267).

In addition to studies which directly addressed mixed methods research, there are a good number of studies that have utilized mixed methods research in the design of the study (e.g., Habashi & Worley, 2009; Scott et al., 2007; Sosulsky & Lawrence, 2008).

Mixed methods designs have also been recently used in educational research. For example, Jang et al. (2008) utilized a concurrent mixed methodology for investigating the challenges faced by urban schools, using integrative data analysis strategies. They found that 51% of the studies used qualitative methods, 21% used quantitative methods and 29% integrated qualitative and quantitative methods. Igo et al. (2008) used mixed methods research to investigate note taking conditions and the effect of conditions on student learning from Web-based texts. Igo et al.

(2008) conducted a multi-phase study; first, they integrated qualitative themes and quantitative findings from previous research; then, they conducted a follow-up qualitative investigation and also quantified the data from students' notes to further investigate the issue. Another mixed methods study conducted in the context of education was Scott and Sutton's (2009) investigation of 50 elementary teachers' emotions during workshops on the writing process. Scott and Sutton (2009) used repeated questionnaires and open-ended questions, follow-up questionnaires, and participant interviews. In their study, qualitative and quantitative data revealed opposing results about the relationship between teachers' emotions and change in practice (Scott & Sutton, 2009). Another example is Arnon and Reichel's (2009) study in which closed and open-ended question tools were used in three phases to investigate the qualities of the good teacher. Similar to Scott and Sutton (2009), Arnon and Reichel's (2009) findings from the qualitative phase did not fit those from the quantitative phase.

In applied linguistics, although a number of studies seem to have integrated qualitative and quantitative methodologies (see Dörnyei, 2007) or have utilized triangulation by sources and methods (e.g., Bosher & Smalkosky, 2002; Hawkins, 1985; Jasso-Aguilar, 2005), few studies seem to have utilized mixed methods research the way it is defined in social and behavioral research. One notable example is Lee and Greene (2007). In this study the term mixed methods is used in the title of the article and the authors explicitly acknowledge that they have used a mixed methods design in their study. Using qualitative and quantitative data and integrating the two methodologies, Lee and Greene (2007) studied the relationships between graduate students' placement test scores and grade point average, faculty evaluation, and self-assessment as three measures of the students' academic performance. In their study, Lee and Greene (2007) found that although part of the results coming from quantitative analyses did not show significant differences, the qualitative findings were an

indication of results which were complementary to quantitative results.

3. Methodology

For the purpose of this study, a qualitative method was used to provide an in-depth account of the issues related to the research problem. This method was used because of the exploratory nature of the study and the importance of presenting a rich description of the current status of mixed methods research in applied linguistics.

3.1 Data Collection Procedure

According to the relevant literature, qualitative samples are often *purposive* (Miles & Huberman, 1994; Patton, 2002). Thus, based on the research purpose, the data sources for this study constituted a purposive sample (see Benson et al., 2009; Bryman, 2008; Teddlie & Yu, 2007) of articles published in seven internationally-acclaimed peer reviewed journals in the field of applied linguistics. The data consisted of a corpus of articles published over a period of 14 years, between 1995 and 2008 (with the exception of LTR whose publication started in 1997). More specifically, the sampling scheme for this study was "multi-layered" (see Alise & Teddlie, 2010), which involved the selection of (a) the journals and (b) the articles.

In order to select the journals, the researcher used different sources. The first source was a list of professional journals published by *The Modern Language Journal* (Weber & Campbell, 2004). Weber and Campbell (2004, p. 457) produced the list based on a survey of 104 leading journals "devoted to foreign and second language learning or related fields . . . ." Weber and Campbell's (2004) long list included more than 50 journals such as *Applied Linguistics, Asian Journal of English Language Teaching, Applied Language Learning, English for Specific Purposes, Journal of*

Second Language Writing, Journal of Pragmatics, Journal of Psycholinguistic Research, Journal of Teacher Education, Language in Society, Language Learning, Language Teaching, Linguistics and Education, TESOL Quarterly.

Egbert's (2007) paper on evaluating applied linguistics journals was used as the second source. Her list included 35 professional journals, including: *Applied Linguistics, Applied Language Learning, English for Specific Purposes, Journal of Second Language Writing, Journal of Pragmatics, Journal of Psycholinguistic Research, Language Learning, Language Teaching Research, TESOL Quarterly, IRAL, RELC Journal*, and so forth. Taking into account citation analysis, impact factor, rejection rate, time to publication, availability and accessibility, expert's choice of journals, and readership, Egbert (2007) developed criteria for quality assessment of applied linguistics journals. The results of Egbert's (2007) analysis produced a list of top seven journals according to quality indicators: *Applied Linguistics, English Language Teaching Journal, Journal of Second Language Writing, Language Learning, Modern Language Journal, Studies in Second Language Acquisition, TESOL Quarterly.*

Putting together journal titles from the above lists, the researchers produced a comprehensive list of more than 60 journals (repeated titles were excluded). Then, to select a purposive sample of about 10 % of the total journals, the researchers referred to expert judgment. In doing so, the researchers consulted with two researchers (Ph.D. holders familiar with both qualitative and quantitative research) currently active in the field of applied linguistics to produce the final list. Based on the research purpose and scope and the feedback from the experts, the researcher selected seven journals from the aforementioned list. Aside from repeated titles, there were reasons for excluding other titles to produce the sample. The main reasons for exclusion of other journals were: (a) a number of the journals were not directly related to the field of applied linguistics (e.g., *British Journal of*

Educational Psychology, Computers and Composition, International Journal of Intercultural Relations, Journal of Educational Measurement, etc.); (b) some were published in languages other than English (e.g., *Etudes de Linguistique Appliquée*); (c) the methodology section of several of the journals did not include comprehensive report of the procedures (e.g., *ELT Journal, Language Learning Journal*—see Benson, et al., 2009), (d) some were not internationally acclaimed (e.g., *Korean Journal of Applied Linguistics*); and (e) some were very specific in focus (e.g., *Journal of Second Language writing, Assessing Writing, Language and Cognitive Processes*, etc.).

The final list included the following journals:

1. *Applied Linguistics* (AL)
2. *English for Specific Purposes* (ESP)
3. *Language Learning* (LL)
4. *Language Teaching Research* (LTR)
5. *Language Testing* (LT)
6. *Modern Language Journal* (MLJ)
7. *TESOL Quarterly* (TQ)

After the selection of the journals, the researchers started the process of gathering the data sources, which included the following procedure. First, the electronic versions (Adobe Reader version 7) of all of the articles published from 1995 to 2008 were collected from different e-sources. The missing issues were downloaded and prepared for use. All of the articles were then examined. That is, the abstract and methodology sections of the articles were scanned, focusing on whether the design in each study involved mixing at the stages of sampling, data collection and/or data analysis. Aside from this, the search function of Adobe Reader was used, so that key words or phrases such as *mixed methods*, *multi-method*, *qualitative*, *quantitative*, *triangulation, integrating methods, combining methods* could be spotted in the text. The searches

would allow the researchers to double check parts of the article where reports on combining or integrating methods were made and, this, as Bryman (2008) argued, helped to include articles that were based on both qualitative and quantitative methods. Following Bryman (2008), the articles were examined and selected mainly based on their data collection and data analysis procedures. In this screening phase, a total of 273 articles were produced.

At this point, careful analysis of the content revealed that of the 273 articles 68 had not actually combined qualitative and quantitative methods by any means; rather, one approach influenced the methodology and the components of the other approach (i.e., numbers, statistics, words, verbal description) were only used as a part of the main method. So the final analysis showed that 205 articles attempted to integrate or combine qualitative and quantitative methods at different stages of data collection and/or data analysis.

3.2 Data Analysis

All the 273 articles were closely content analyzed. The content analysis was done qualitatively and, as the study was exploratory in nature, the main method of analysis was "constant comparison analysis" (Glaser & Strauss, 1967). At the same time, the researchers sought to present a "rich description" (Erickson, 1986) of the content of the articles, particularly those parts that involved the description of how mixing or combining took place in the process of data collection and analysis. In doing so, rigorous examination of the content was carried out through an iterative process (for some articles the author read, examined and reexamined the methodology section more than three times, highlighting the key points) until "redundancy" (Lincoln & Guba, 1985) was achieved.

In fact, the analysis began with "a broad consideration of theoretical issues" (Davis, 1995, p. 445) related to the research questions, using classifications and categories from previous

research to provide rigorous coding procedures (Strauss & Corbin, 1998), which would enhance *credibility* of the study (see Davis, 1995). At the same time descriptive notes about different stages of combining were kept for the sake of presenting a rich description.

Following Alise and Teddlie (2010), analysis procedures used in the present study were based on both "manifest content (concrete terms used in the code sheet) and latent content (underlying nature of the methods determined by the coder's interpretation of the information contained in the article" (p. 111). So the analysis involved completing a code sheet as well as making descriptive notes of the contents of the articles.

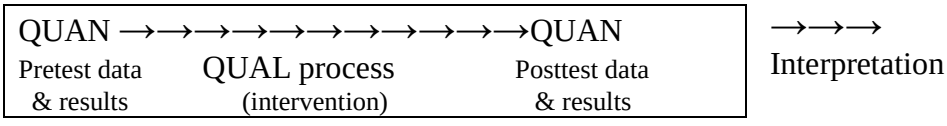
The code sheet for analysis of research designs and sampling designs were developed based on the methodological framework presented by Creswell, Plano Clark, and Garrett (2008). Based on extensive literature reviews and analysis of the methods sections, Creswell et al. (2008, pp. 67-68) classified the designs as either "concurrent" (designs that would make use of qualitative and quantitative research concurrently) or "sequential" (designs that can be conducted sequentially). Each of the two major designs was then classified into more specific designs (see Figure 1).

Concurrent Designs

I. Triangulation Design:

QUAN (data & results) →→ Interpretation ←← QUAL (data & results)

II. Concurrent Embedded Design:



Sequential Designs

III. Explanatory Design:

QUAN (data & results) →→→→ QUAL (data & results) →→→→ Interpretation

IV. Exploratory Design:

QUAL (data & results) →→→→ QUAN (data & results) →→→→ Interpretation

V. Sequential Embedded Design:

QUAL →→→→QUAN →→→→QUAL →→→→ Interpretation

Before Intervention Intervention Trial After Intervention

Figure 1: Mixed-method research designs (from Creswell et al., 2008, p. 68)

3.3 Cohen's Kappa for Inter-coder Reliability

To ensure reliability of the coding, an independent coder coded a small sample of the research articles. About 20 % of the sample (i.e., 20 articles) was coded by the second researcher. Cohen's Kappa was then used to measure the degree to which the coders achieved agreement in coding the designs (see Cohen, 1960). This index is used with sets of categorical/nominal data. For this study, Kappa coefficient was 0.82 for the coding of research designs, which indicates a good agreement (see Altman, 1991).

4. Results

To explore the mixed-method designs used in applied linguistics research, the researchers utilized the methodological framework presented by Creswell et al. (2008).

Table 1 and Table 2 present the frequencies with which each design was used in the articles, in addition to expected frequencies and residuals. The results of the chi-square goodness-of-fit test for the total frequencies (see Table 3) revealed that there were significant differences in the designs employed in the journal articles ($\chi^2 = 379.4$, df = 5, $p < .001$).

The overall percentages for the use of designs in the studies are quite different. As shown in Table 1, concurrent designs were used more frequently (71.71 %) than sequential designs (24.88 %) and a small number of the studies (3.41 %) used designs that did not exist in Creswell et al.'s (2008) classification. Further, among studies with concurrent designs, few used the concurrent embedded design. Rather, a good number of the studies used triangulation (66.34 %), which was the most frequently used design. Embedded designs in both concurrent and sequential categories, however, were used with the lowest frequencies, 5.37 % and 1.95 % respectively. Similarly, the exploratory design was used in a limited number of articles (6.83 %). Finally, the design that was more common in the sequential category was the explanatory design (16.10 %).

Table 1: Frequencies of mixed methods research designs used in the articles

Note. Abbreviations: AL: Applied Linguistics; ESP: English for Specific Purposes; LL: Language Learning; LT: Language Testing; MLJ: Modern Language Journal; TQ: TESOL Quarterly; LTR: Language Teaching Research

Design / **Journal**	**Concurrent Designs**				**Sequential Designs**						**Other**	
	Triangulation		Embedded		Explanatory		Exploratory		Embedded			
	F	P %	F	P %	F	P %	F	P %	F	P %	F	P %
AL	23	79.31	0	0.00	3	10.34	2	6.90	0	0.00	1	3.45
ESP	19	61.29	0	0.00	10	32.26	1	3.23	0	0.00	1	3.23
LL	16	59.26	5	18.52	3	11.11	2	7.41	0	0.00	1	3.70
LT	24	72.73	0	0.00	2	6.06	4	12.12	2	6.06	1	3.03
MLJ	28	60.87	6	13.04	7	15.22	3	6.52	1	2.17	1	2.17
TQ	19	63.33	0	0.00	8	26.67	1	3.33	0	0.00	2	6.67
LTR	7	77.78	0	0.00	0	0.00	1	11.11	1	11.11	0	0.00
Total	**136**	**66.34**	**11**	**5.37**	**33**	**16.10**	**14**	**6.83**	**4**	**1.95**	**7**	**3.41**

Table 2: Observed and expected frequencies for the designs

Designs	*Observed N*	*Expected N*	*Residual*
Conc.	136	34.2	101.8
Triangulation	11	34.2	- 23.2
Conc. Embedded	33	34.2	- 1.2
Seq. Explanatory	14	34.2	- 20.2
Seq. Exploratory	4	34.2	- 30.2
Seq. Embedded	7	34.2	- 27.2
Other	205		
Total			

Table 3: Results of chi-square goodness-of-fit test for research designs

Test	**Value**
Chi-square	379.400
df	5
Asymptomic Significance	.000

Aside from the quantitative analysis of the results, the data were explored in detail to present rich description of the emerging patterns. What follows is a qualitative treatment of the data.

The first notable issue is the way researchers addressed their designs and whether they have used mixed methods terminology to

elaborate on the procedures. Although it was acknowledged in only a few studies that mixed methods was used and only rarely did the articles refer to the names of mixed methods research designs, the term triangulation was used in a good number of studies. (In the following examples the numbers in the square brackets correspond to those used for numbering the data sources.)

[37] p. 33: …a triangulation of data collection procedures…

[65] p. 2: We used different measures, data sources, and methods. The combination of measures, data sources, and methods not only allowed triangulation of the finding . . . .

[138] p. 499: In order to reveal teachers' beliefs, knowledge, and practices about CLT, we employed triangulation that included qualitative and quantitative data sources (or multiple data sources) of LOTE teachers' perspectives.

[144] p. 17: In keeping with this approach, data were collected from multiple sources in varying contexts in order to permit triangulation of data, that is, the crosschecking of findings from different perspectives.

As mentioned above, triangulation was the most commonly used design in mixed applied linguistics research. This method has been recommended by researchers to ensure internal validity of research (see Davis, 1995; Long, 2005). However, triangulation as a subcategory of mixed methods research would be defined differently. Triangulation in this sense is not just using different sources and/or different methods. What makes triangulation different in mixed methods research is that it would require at least one qualitative and one quantitative component. Ideally, triangulation in mixed designs would be utilized at different stages of the study (i.e., sampling, data collection, data analysis). However, most of the applied linguistics studies examined in the present research project used triangulation at one or two stages only.

Further, triangulation in applied linguistics research involves two main types: triangulation by methods and triangulation by

sources (see Long, 2005). Long (2005) did not draw a clear distinction between triangulation within a particular research method (qualitative or quantitative) and triangulation across research methods (qualitative plus quantitative) (see Denzin, 1978). Most of the studies examined here used a triangulation of the latter type:

[13] p. 207: The study employs both qualitative and quantitative approaches …
[22] p. 183: Speech rate, redundancies, interpersonal and disciplinary features and references to local culture were compared using both quantitative and qualitative methods.

As mentioned above, in a good number of articles mixing did not take place consistently at different stages and levels. In several studies the researchers only used mixing at the analysis stage without even acknowledging that they had integrated qualitative and quantitative methods. In such cases, a third type of triangulation emerged in the process of data analysis. We can call this type *triangulation by methods of analysis* or, simply, *triangulation by analyses* (see Denzin, 1978). Several researchers asserted that they used both qualitative and quantitative methods of analysis so that one would complement the other:

[5] p. 241: Two types of analysis were performed: . . . a quantitative analysis… a qualitative analysis . . . .
[6] p. 374: Data analysis for the survey involved both quantitative and qualitative procedures…
[28] p. 52: … we have carried out a quantitative and qualitative analysis of actual corpus-based data…

In a more detailed analysis of the data, it became evident that from among the 136 articles in the data sources that used triangulation in a mixed design, 63 used triangulation by analyses

(i.e., triangulation only at the level of data analysis). Table 4 shows the frequencies of triangulation by analyses in different journals.

Table 4: Triangulation by analyses: frequencies of occurrences

Journal	AL	ESP	LL	LT	MLJ	TQ	LTR	TOTAL
Triangulation by analyses	8	8	10	12	14	9	2	63

It should be noted that triangulation, among other designs, was easier to find and code. To find other designs in the articles, more careful reading of the sections was essential, as the names of other designs were not mentioned directly by the researchers. For example, the following extracts would reveal that the researcher(s) used a sequential design:

[37] p. 34: Staff questionnaires were distributed via campus mail on February 1, 1997. Distribution of the international student questionnaires was conducted from February 1 through April 30 1997. . . . Follow-up interviews were attempted with students . . . . The final procedure for data collection was through onsite observations . . . .
[160] p. 344: The process of analysis began with the application of a primarily quantitative discourse analysis system designed specifically for game-playing; . . . .This quantitative analysis was followed by an in-depth qualitative, microgenetic analysis . . . .

Furthermore, terms similar to those used for naming the designs by Creswell et al. (2008) were, in a number of papers, used by the researchers to convey similar functions. What was absent in most of the articles was mentioning that the design utilized was a mixed one:

[75] p. 544: Because this is an exploratory study, the results of the quantitative data analyses are basically presented for descriptive purposes

only. To supplement the descriptive results, I also checked the degrees of the EFL and ESL groups' changes over the 3.5 years by employing analysis of variance (ANOVA) . . . .

Although scant mention of mixed methods terminology was made in the studies, in a number of articles the researcher(s) used terms such as multiple methods, multiple data analysis, and mixed methods. This shows that there is a growing awareness of the value of mixing qualitative and quantitative methods among these researchers.

The first example emerged in data source [26]. In this study, the term "mixed methods" was used in the title: *Changing Bilingual Self-Perceptions from Early Adolescence to Early Adulthood: Empirical Evidence from a Mixed-Methods Case Study.* The author (Caldas, 2007) combined ethnographic field notes and interviews with a quantitative measure of language preference. These data were collected and analyzed separately and there was little evidence of data consolidation in the concluding sections.

In data source [65], the authors attempted to emphasize the value of triangulation in classroom research. The title of the study is: *Triangulation in Classroom Research: A Study of Peer Revision.* Throughout this article, the researchers tried to justify the value of using both qualitative and quantitative research and triangulation:

[65] p. 2: We used different measures, data sources, and methods. The combination of measures, data sources, and methods not only allowed triangulation of the finding

. . . .

[65] p. 6: To thoroughly understand the effects of the training and to validate the research findings, we used triangulation, particularly methodological and data triangulation. We achieved methodological triangulation through multiple measurements and a combination of quantitative and qualitative methods, data triangulation through using multiple data sources and data sets. Because "operationalism is better served by multiple measures of a given concept or attribute" (Isaac &

Michael, 1981, p. 92), we assessed "effects of training" using multiple criteria (triangulation of measurement): (a) students' ability to critique peer writing, (b) quality of student writing, and (c) students' attitudes toward peer revision and writing. We used different methods of data collection, data from different sources, and both quantitative and qualitative analyses.

Data source [75] presented the multi-method aspect of dealing with the data in its title: *A Multiple-Data Analysis of the 3.5-Year Development of EFL Student Writers.* In this study, both qualitative and quantitative data were presented in separate sections and the author described the significance of using multiple data sources in different parts of the paper:

[75] p. 490: The present study investigated the changes in Japanese students' English writing behaviors over a 3.5-year period using multiple data sources including written texts, videotaped writing behaviors, and stimulated-recall protocols. Data from student interviews supplemented the analyses.

The title of data source [133] was also an instance of reflecting the multi-method aspect of the study: *Computer-Aided Writing in French as a Foreign Language: A Qualitative and Quantitative Look at the Process of Revision.*

A direct reference was made to mixed methods research in data source [143]. In this example, the authors stated that they had used "a four-phase hybrid design that combined qualitative and quantitative approaches to instrument development" (Shimizu & Green, 2002, p. 230). The authors further elaborated on the value of adopting a mixed design:

[143] p. 236: The current study employed a mixed method (i.e., qualitative/quantitative) design. This approach had the advantage of providing a more holistic view of attitudes toward kanji. Through the use of in-depth interviews with Japanese language scholars specializing in kanji, it was possible to facilitate the subsequent use of quantitative

methods and ultimately achieve a better understanding and interpretation of the results of the study as a whole.

Data source [161] used a title in which multi-method data analysis was mentioned: *Effects of Study-Abroad Experiences on EFL Writers: A Multiple-Data Analysis.* In this study, a range of data sources were used and multiple analysis of the data was a particular feature of the analysis procedure.

Another article in which mixing was mentioned was data source [166]. Kissau and Wierzalis (2008) acknowledged that they had used a mixed methodology to carry out their research:

[166] p. 402: A large-scale study was conducted to investigate gender differences in L2 motivation and participation among Grade 9 core French students in Canada. A mixed methodology was employed to investigate gender differences in a variety of motivational factors among Grade 9 French as a second language (FSL) students. Approximately 500 students in Grade 9 FSL completed a questionnaire. The significant findings were then explored in interviews with students and teachers.

Finally, in data source [194] (Lamb, 2008) the author made clear that he had used a mixed methods design and elaborated on the design of the study by referring to research in the social sciences:

[194] p. 757: Using a mixed-method design, the study aimed to track changes in their reported motivation and learning activity and to identify internal and external factors which might be associated with the changes.
[194] p. 761: An equal-status mixed-method strategy was adopted (Tashakkori & Teddlie, 1998). . . . The rationale for employing mixed methods was that "a combination of qualitative and quantitative designs might bring out the best of both approaches while neutralizing the shortcomings and biases inherent in each paradigm" (Dörnyei, 2001, p. 242).

5. Discussion

Research designs that were explored in the present study corresponded well with those presented by Creswell et al. (2008), and shared similar features with the designs discussed in Greene et al. (1989). The analysis of research designs revealed that the most common design used in the articles was the concurrent design. This finding is in line with the findings of meta-analysis articles on mixed methods research in the social sciences, indicating that, generally, concurrent designs are more frequent than sequential designs (Collins et al., 2006; Plano Clark, 2006, as cited in Christ, 2007). Among the subcategories of concurrent and sequential designs, triangulation in the concurrent category outnumbered the other subcategories by a wide margin. About 66 % of the papers used triangulation whereas other subcategories comprised a small portion of the designs. This is probably because triangulation has been widely used in applied linguistics research in the past two decades. Triangulation started to receive special attention in the mid-90s when scholarly journals like *TESOL Quarterly* published papers on the importance using a variety of sources and methods (e.g., Davis, 1995; Lazaraton, 1995). This method was later used widely in ESP research and considered to be an approach to improve validity of research (see Jasso-Aguilar, 2005; Long, 2005). Therefore it appears that researchers used triangulation designs as a self-sufficient strategy, not as a subcategory of mixed methods designs. It might be inferred that, unlike a large number of studies that used triangulation within a particular method (i.e., qualitative or quantitative), in the studies with mixed research designs triangulation by methods was urged by the research purpose and both qualitative and quantitative methods were used by the researchers. So mixed methods triangulation uses a variety of sources and methods across qualitative and quantitative components and, as a subcategory of concurrent designs, is different from triangulation commonly used in applied linguistics research (For a detailed treatment of *within-method* and *between-*

methods triangulation, see Denzin, 1978). However, parts of the findings suggest that although triangulation was not defined in the sense of mixed research in applied linguistics articles, it shared with mixed methods triangulation some common functions such as "validity checking" and "seeking complementary information" (for a detailed discussion of the functions, see Hammersley, 2008).

In addition, as shown in the results section, a particular type of triangulation emerged in the study that would take place only at the stage of data analysis, utilizing more than one method of analysis. This type, i.e. triangulation by analyses, was different from triangulation by sources of data and methods of data collection suggested by Long (2005).

The important point to note is that combining qualitative and quantitative methods would seem to serve the research purpose (cf. Bryman, 2008) and the researchers would adopt a pragmatic approach toward integrating qualitative and quantitative methods. The results of the study, especially the descriptive notes made on the nature and function of mixing methods in the research papers, would partially support the idea that the rationale behind adopting a particular design could be linked to practical considerations in terms of what the studies were intended to investigate. Different designs, thus, were developed for a variety of purposes.

For example, triangulation was, in many cases, used to provide supplementary data in multilevel discourse analysis, needs analysis and program evaluation (e.g., data source [64]). As Greene at al. (1989, p. 260) discussed, these types of designs (in their view "expansion designs") would be often used to explore both "program processes" (qualitative) and "program outputs" (quantitative). This is particularly relevant to validation studies. Triangulation, complementarity – for dealing with "overlapping but also different facets of a phenomenon" (Greene et al., 1989, p. 258) – and expansion – aiming for "scope and breadth by including multiple components" (p. 260) – are mixed-method designs that

were found by Greene et al. (1989) to be very useful for evaluation purposes.

The data in this study would reveal an emergent theme, a tendency in some of the journals to use these methods more frequently. In the present study, triangulation was the most frequently used design in all of the journals. However, articles published in *ESP Journal* and *Language Testing* seemed to use triangulation for needs assessment, program evaluation, and test validation. As this is not a central finding of the present study, more accurate accounts of this would require further research.

Concurrent embedded designs, in some cases, were used to qualitatively explore the processes within an experimental design (e.g., data sources [66], [84], [129]). Such designs were used frequently to investigate the process of second language acquisition (e.g., data sources [66], [84] from *Language Learning*). Concurrent embedded designs were used in articles published in *Language Learning* and *MLJ* but not other journals.

Sequential explanatory designs were used to qualitatively explain the findings from the quantitative phase. These would include adding explanatory power to coding and rating procedures (e.g., data source [55]), further analyzing and explaining performances on quantitative measurement instruments (e.g., data sources [62], [139]), and qualitatively evaluating DIF items after using statistical procedures (e.g., data source [110]).

Sequential exploratory designs were selected to expand the scope of the qualitative phase and further explore the problem quantitatively. The qualitative phase may also be used as a pilot study. Such designs would be used in developing measurement instruments like questionnaires, tests, rating scales (e.g., data sources [109], [143], [178]) and/or validating measurement instruments (data source [93]) —for more on the use of mixed methods research in developing quantitative instruments see Onwuegbuzie, Bustamante, and Nelson (2010). Another example is data source [118], a project report on developing and validating a discourse completion test. The exploratory designs could also be

simply used to provide quantitative support for the qualitative analysis of data (e.g., data source [61]). Like exploratory designs, sequential embedded designs would be used to validate measurement instruments (e.g., data source [92]). Also, these designs can be helpful in investigating classroom discourse and classroom interaction patterns (e.g., data source [146]).

6. Concluding Remarks

The analysis of the designs of the studies with a primary focus on data analysis and data collection procedures revealed that most of the designs used in applied linguistics research corresponded to those previously emerged in the social and human sciences (cf. Creswell et al., 2008). Also, as few of the studies acknowledged the names of the designs, it appears that mixed methods designs have not been introduced appropriately into applied linguistics research and researchers adopted a pragmatic (i.e., practice-oriented) approach toward mixing qualitative and quantitative methods. In fact, based on the research purpose, the researchers defined qualitative and quantitative designs separately. These independent components with separate designs were then used to complement each other.

To sum up, it seems that applied linguistics research has great potential for making use of mixed methodology. However, a deeper and more comprehensive understanding of mixing qualitative and quantitative components at different stages of the study needs to be developed (e.g., forming the research questions, data collection, data analysis, data consolidation, developing meta-inferences). To this purpose, it would be helpful for researchers to examine and experiment various types of mixed-method designs currently used in the social and human sciences. Further, it would be possible for applied linguistics researchers to experiment novel designs based

on their specific research purpose(s) and the requirements of the research context. Finally, it should be noted that developing informed opinions about mixed methods research and also making creative use of different mixed methods designs would lead to the improvement of the quality of research in the field of applied linguistics.

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