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An Explicit Pragmatic Approach to Integrative Data Analysis Strategies for Mixed Methods Research

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Abstract

Mixed methods research is becoming an important methodology for the investigation of various topics in applied linguistics. However, data integration remains a challenge for mixed methods researchers and thus needs further development. This study discusses the integrative data analysis strategies used in an embedded mixed methods study in applied linguistics, illustrated through two phases of the study, and the way in which the adoption of a pragmatic approach explicitly aids data integration by abductive reflection on the knowledge acquired. This study investigated the language learning strategies used by English as a Foreign Language nursing students in higher education in Macao, and the effectiveness of the students' learning outcomes as a result of strategy instruction. Six integrative data analysis strategies are discussed, and the explicit pragmatic approach that guided the exploratory sequential design sheds further light on the integrative data analysis.

Keywords: Data analysis, Integrative analysis, Pragmatic approach, Mixed methods, Language learning strategies, Strategy instruction

1. Introduction

Pragmatism has been advocated as the underlying philosophical stance for mixed methods research (Morgan 2007, 2013, 2014; Teddlie and Tashakkori 2009, 2011). Many researchers have investigated Language Learning Strategies (LLS)[1] and Strategy Instruction (SI)[2] using mixed methods research, or they may have used pragmatism implicitly as a theoretical approach to guide the design and implementation of their studies (e.g., Bai, 2015; Fan 2010; Hong-Nam and Leavell 2011). However, using pragmatism explicitly in shaping LLS and SI research can provide the backbone of the research and a more complete understanding of the results during data integration because it allows abductive reflection on the knowledge-reasoning phase by moving back and forth through induction and deduction (Morgan 2007). Data integration in mixed methods study has remained a challenge to researchers (Creswell and Plano Clark 2011; Riazi and Candlin 2014), with Plano Clark, Schumacher, West, Edrington, Dunn, Harzstark, Melisko, Rabow, Swift, and Miaskowski (2013) among the few who have discussed five strategies used for data integration at the analytical and interpretation level in mixed methods research. These five strategies comprise learning from previous studies, collecting sufficient data, analysing data separately before integration, focusing on in-depth data analysis and developing an emerging approach when analysing data.

The present LLS and SI study attempts to employ pragmatism as its philosophical perspective in mixed methods research design and to use a pragmatic approach as a strategy in data integration as it aids data integration at the analytical and interpretation level.

The study will begin with a brief introduction to pragmatism and a discussion on why this approach has been adopted, followed by a concise description of integration and mixed methods designs. This will be followed by an explanation of the benefits of adopting an explicit pragmatic approach in the analytical and interpretation level of data integration.

2. Pragmatism

With pragmatism as the paradigm for mixed methods research, both quantitative and qualitative research methods can be used in a single study because the research question should be the primary focus and the driver of methodologies, and the forced-choice dichotomy between quantitative and qualitative approaches should be abandoned (Tashakkori and Teddlie 2003).

The pragmatic view is pluralistic (Johnson and Onwuegbuzie 2004), and oriented towards ‘what works’ (Creswell and Plano Clark 2011, 42) in practice, viewing reality as both singular and plural (Johnson and Onwuegbuzie 2004). It also assumes that no single scientific method is able to discover the truth (Morgan 2007). The pragmatic approach relies on abductive reasoning, which combines both induction and deduction (*ibid.*) and emphasizes intersubjectivity, which captures the relationship between subjective and objective approaches – as in qualitative and quantitative approaches – and uses a ‘reflexive’ orientation (*ibid.*, 71–72). Based on this approach, ‘transferability’ is also emphasized, as knowledge acquired from one method can be applied where appropriate in other situations (*ibid.*, 73).

Greene, Caracelli, and Graham (1989) suggest five purposes for mixed methods evaluation design: triangulation, complementarity, development, initiation, and expansion. Three of these – specifically triangulation, development, and expansion – are used in this study. Triangulation is used intentionally to validate results obtained from different methods. Further, clearly understanding students' LLS by using mixed methods can help develop or inform the next phase of SI, namely development. Finally, with expansion, both the 'breadth and depth of inquiry' into LLS and the effects of SI can be achieved. Thus, this design may provide detailed findings that enable future researchers to use different and/or mixed methods in pursuit of their research goals. All three mixed methods research purposes followed pragmatism as the paradigm (Riazi and Candlin 2014, 146). Pragmatism also emphasizes choices regarding the research design as the 'core of research-based inquiry' (Morgan 2013, 42).

In keeping with the above, a pragmatic approach was adopted in the present study because it offered an epistemological justification and rationale for using mixed methods. The current study used the practical rather than the philosophical aspects of pragmatism, namely a 'practically pragmatic approach', in selecting the appropriate mixed methods design.

3. Pragmatic Approach of the Research

Higher education English should be understood in the context of foreign language students' use of LLS so that teachers can enhance the curriculum, facilitate a better understanding of the effectiveness of SI, and assess its influence on both students' use of LLS and on their learning outcomes. Thus, the research design was shaped based on a 'practically pragmatic approach', linking the 'what' and the 'how' to achieve the goals of understanding students' LLS and the effects of SI.

Employing only one kind of method for investigating LLS may prove inadequate for understanding the phenomenon in depth. Morgan (2007), for example, regards paradigms as 'shared beliefs in a research field', arguing that many researchers have duly arrived at a consensus across various specialties with regard to what are the most meaningful questions and what are the most appropriate methods to address those questions, effectively adopting a 'community of scholars' perspective (50–54). Hence, many researchers in the applied linguistics community have used mixed methods designs in order to understand phenomena such as LLS and the effects of SI on learners (e.g. Bai, 2015; Carrier 2003; Fan 2010; Hong-Nam and Leavell 2011; O'Malley and Chamot 1990). Thus, when making a decision on how to research LLS and the effects of SI, 'what works' – that is, using the most appropriate instruments to fully assess the subject under study – becomes of paramount importance. In addition, pragmatism – combining abductive reasoning, emphasizing intersubjectivity and using a reflexive orientation – is significant as learners' LLS and the effects of SI are difficult to probe because they are interconnected with many factors (Cohen 2011; Oxford 2011), including learner variables, learning contexts and the learning environment.

Onwuebuzie and Leech (2005) suggest that pragmatic researchers may be flexible in their investigations because they need to address various research questions that arise. Further,

Johnson and Onwuegbuzie (2004) suggest that the principle of dissolving subject-object dualism in pragmatism is vital. Taking this epistemological position that there are many routes to knowledge, a problem-solving and action-focused inquiry process is important when researching LLS and SI since knowledge is derived from the interaction between a person and the environment. Therefore, pragmatism plays an important role in shaping the research and also serves as one of the strategies for enhancing data integration.

4. Integration

Mixed methods research has been widely applied in language teaching and learning (Riazi and Candlin 2014). Relatedly, data integration is a process whereby data from quantitative and qualitative approaches are combined in order to generate a thorough understanding of the subject under study (Creswell 2015). Data integration entails an interaction or dialogue between both qualitative and quantitative data (O'Cathain, Murphy, and Nicholl 2010). However, data integration remains a challenge for mixed methods researchers (Creswell and Plano Clark 2011; Riazi and Candlin 2014), who often fail to integrate their collected qualitative and quantitative data effectively (Bryman 2007; O'Cathain, Murphy, and Nicholl 2010). Bazeley (2012), for one, has illustrated different approaches to effective data integration, such as integrating results from the analysis of different data components, using one form of data to analyse another, integrating multiple data during analysis, integrating data after analysing them both qualitatively and quantitatively, integrating results using the same data source, which provides both qualitative and quantitative information, and using iterative and longitudinal inquiries for mixing the data sources. In addition, Bazeley and Kemp (2012) have illustrated various ways and levels for mixing data using metaphors, including combining for completion, like a jigsaw, combining for enhancement, like mixing, combining for triangulation, exploring through blending, and integrating data through iterative inquiries. Further, Fetters, Curry and Creswell (2013) have discussed how integration can be achieved at different levels through the study-design level, method level, interpretation level and reporting level in mixed methods research.

5. Mixed Methods Designs

Mixed methods research can be conducted through various designs, one of which is embedded design (Creswell and Plano Clark 2011). 'Embedded' means that either the quantitative data are inserted within the qualitative data or the qualitative data are inserted within the quantitative data. Additionally, there are three other more recent suggestions for design, including exploratory sequential, explanatory sequential and convergent designs (Creswell 2015). Exploratory sequential design starts with qualitative data collection. In the present study, an embedded design approach was adopted whereby the quantitative data were inserted into the qualitative data within case studies in the first phase in order to understand students' LLS. Following on from this understanding, the study progressed to the second phase – SI, which entailed evaluating the strategies that can be taught to facilitate language learning. In the second phase – which also employed embedded design – the qualitative data were inserted before, during and after the quantitative data gathered during a quasi-experiment conducted to explore the effects of SI. Explanatory sequential design, on

the other hand, starts with a quantitative data collection and analysis phase, followed by a qualitative phase for explanation. As the name suggests, convergent design involves both quantitative and qualitative data being collected and analysed at the same time, followed by an integrated analysis. Moreover, the integration of both quantitative and qualitative approaches can be variously conducted at the design, methods, and analytical and interpretation level (*ibid*. 2015). Since this paper focuses on the last level, it will be discussed next.

6. Data Integration Strategies at the Analytical and Interpretation Level

Data integration at the analytical and interpretation level can largely be carried out in two ways: (1) by presenting both quantitative and qualitative data in tables, or figures, and (2) by presenting the data in a discussion when analysing both forms of data. Guetterman, Fetters, and Creswell (2015) have examined how data integration can be facilitated through joint displays in tables of both qualitative and quantitative data in mixed methods research. Stange, Crabtree and Miller (2006), for their part, have discussed the different approaches that authors can use for disseminating the results of multi-methods research. Bazeley (2012) has discussed various approaches to effective data integration, while Bazeley and Kemp (2012) have illustrated different ways to combine data to facilitate understanding (see above). However, the actual strategies and steps used for data integration have not been discussed, except in Plano Clark et al. (2013), where five strategies for data integration were briefly touched upon, while in Bazeley (2012) and Bazeley and Kemp (2012) only iterative inquiry was discussed. Arguably, greater attention should be paid to the discussion of strategies as researchers need guidelines on how to combine the data at this level. Staging the strategies for data integration at this level can clearly provide some guidelines on data integration. The purpose of this research was therefore to focus on examining the strategies that researchers could use to integrate both qualitative and quantitative data at the analytical and interpretation level, and to argue that the use of an explicit pragmatic approach can duly enhance data integration.

7. Methods

7.1 The Research Study

Phase one of the study sought to determine the LLS of some higher education nursing students in Macao, and to examine whether there were any learner variables that could affect the strategies they used when learning English as a foreign language. This entailed examining the students' LLS in depth via three case studies with high, medium and low English proficiency. Various data were needed to assess the LLS of the students and were shaped by an explicit pragmatic approach to adopting the most appropriate methods. Through the use of questionnaires, group interviews and observations, a thorough analysis of the students' LLS and their respective validity was thus ensured before SI planning and intervention in the second phase.

The data in phase one were collected using two questionnaires (SILL – Strategy Inventory for Language Learning, a 5-point Likert scale inventory for assessing students' LLS developed

by Oxford in 1989, and a questionnaire inquiring into the students' backgrounds) administered to 208 nursing students in one higher education institution (including students in years one through four). Group interviews with a total of 24 students from two second-year nursing classes were conducted, with eight students consequently constituting each case study of high, medium and low English proficiency. These two classes of 47 students were also observed during their English classes. The quantitative data (SILL and background questionnaires) were embedded within the case studies to achieve a better understanding of the students' LLS in the first phase.

Phase two subsequently sought to understand the effects of SI on the students' LLS and learning processes. After studying the students' LLS in phase one, phase two could be better planned. Again, various data were needed to understand the students' learning outcomes in terms of their modifications in LLS employed and their learning processes. Thus, the adoption of an explicit pragmatic approach also allows the usage of suitable methods to fully assess the effects of SI.

In the second phase, an intervention, or a quasi-experiment was conducted with one second-year nursing class (N = 23) serving as a treatment group while another second-year nursing class functioned as a comparison group (N = 24). Within this quasi-experimental phase, quantitative data were collected to measure the different aspects of the effectiveness of SI, which included an in-depth inquiry into the processes. Qualitative data were embedded before (group interviews with the same groups of students in the treatment group, N = 12), during (observations of the treatment group, and diaries submitted by students once every week for 12 weeks, N = 23), and after (group interviews with the same students, N = 12) the quasi-experimental phase. Thus, an embedded quasi-experimental design was used in the second phase.

Both phases of the research used embedded mixed methods design, and each were in line with exploratory sequential design as the data gathered in the first phase of studying the students' LLS helped to further explore the outcomes of SI in the second phase. The setup of this exploratory sequential design was informed by an explicit pragmatic approach. The strategies employed for data integration were discussed and explained using the data gathered in the two phases. Additionally, all three mixed methods research aims (triangulation, development and expansion) fulfilled the pragmatism paradigm (Riazi and Candlin 2014).

8. Data Analysis and Integration

As mentioned above, in these embedded mixed methods and embedded mixed method quasi-experimental designs, embedding occurred at the design and the data analysis and interpretation levels. Since data integration remains a challenge for many mixed methods researchers (Creswell and Plano Clark 2011; Riazi and Candlin 2014) and entails an interaction or dialogue between both qualitative and quantitative data (O'Cathain, Murphy, and Nicholl 2010), in this section, data gathered in the two phases of this study are used to illustrate how both the qualitative and the quantitative data were integrated.

Four sources of data were used in the first phase: group interviews, observations, the SILL

questionnaire, and the student background questionnaire. Descriptive data collected from group interviews and observations might provide more in-depth, rich, valid, and reliable data for the study. Collecting descriptive data was important because detailed data from the students could be obtained from group interviews to determine their use of LLS (Oxford 2011) and more objective data could be provided from observations (Cohen 1998). Administering the questionnaires was useful, particularly for a large number of participants, because doing so might also provide a 'bigger picture' for the research in order to comprehensively assess the use of LLS by all nursing students.

Four sources of data were also used in the second phase to study the modifications in students' LLS after SI: group interviews, observations, the SILL questionnaire, and diaries. Descriptive data collected during the group interviews, observations and diaries were designed to provide more in-depth material for the study. Moreover, diary entries could provide personal views about LLS, while data from the SILL questionnaires could give rise to a structured and straightforward analysis of the students' LLS before and after the SI intervention.

For the interviews, observational data and diary entries, the analysis was based on qualitative research method principles, *viz*. an inductive process of firstly searching for various LLS, then identifying patterns in the data before finally making interpretations (Cohen, Manion, and Morrison 2011; Patton 2002). As all the group interviews were conducted in Cantonese, the students' native language, the main points from the interviews were summarized and translated. The data and diary entries were subsequently reviewed to identify the students' use of LLS. Regarding the SILL in phase one, content analysis was performed for the 24 selected students, and the mean SILL scores were calculated for the high, medium, and low proficiency groups. The Statistical Package for the Social Sciences (SPSS) (version 20) software program was then used to process the quantitative data on all the nursing students' use of LLS gathered from the SILL questionnaires and student background questionnaires (including descriptive statistics, analysis of variance (ANOVA), cross tabulations, and the Mann-Whitney U and Kruskal-Wallis tests). The quantitative data from the SILL and student background questionnaires were then linked to the qualitative data on the 24 interviewees and accordingly used in the integrated analysis (Creswell and Plano Clark 2011). Means and standard deviations were calculated for the SILL and the six strategy groups[3] to rank the most to least frequently used strategies and to triangulate with the qualitative data from the interviews and observations of the 24 students, together with the statistically significant items found in the student background questionnaires. In phase two, for the SILL, an independent samples t-test was conducted to gauge whether there were any statistically significant differences in the SILL mean scores between the treatment and the comparison groups before the SI in each group of strategies; paired samples t-tests were also conducted to analyse the mean score differences in each group pre- and post-SI. Further, another independent samples t-test was carried out to ascertain whether there were any differences in the SILL mean scores between the treatment and the comparison groups in each group of strategies after SI. Thus, the effects of SI on the students' LLS could be examined.

Abductive reasoning with intersubjective and transferability approaches through a pragmatic

stance was used for the data analysis of the interviews, questionnaires, and observations to document the high, medium, and low proficiency groups, capturing the students' use of LLS in phase one (Creswell 2007). The LLS employed by the students were examined using both qualitative and quantitative data, with the three cases capturing the students' experiences of applying LLS in the four skills (reading, writing, listening and speaking), accompanied by the observational data. In phase two, the same approach encompassing interviews, diary entries and SILL was used to analyse the effects of SI on students' use of LLS.

There are two commonly used strategies for data integration: the conversion of quantitative data into cases for qualitative analysis (e.g. Onwuegbuzie, Slate, Leech, and Collins 2007, 2009, cited in Morgan 2013, 46) and the conversion of qualitative data into figures for quantitative analysis (Neuendorf 2002; Weber 1990, cited in Morgan 2013, 46).

In this study, these two strategies were used for data integration in which the quantitative data from both the SILL and student background questionnaires were integrated into the three case studies with other qualitative data collected during the first phase, determining the students' use of LLS. Data generated from group interviews could provide useful insights into why students answered their questionnaires in particular ways and might overcome or compensate for each instrument's limitations in generating deeper understanding.

In the second phase, designed to examine the effects of SI on students' LLS, content analysis was used to integrate qualitative data (from group interviews, diary entries, and observations, quantized into percentages and/or frequencies) with quantitative data to better illuminate the modifications in students' LLS before and after SI. An analysis based on a pragmatic approach was also performed so that the qualitative data that were embedded within the numerical data from the SILL could supplement and provide in-depth experiences of how students' LLS had changed.

9. Results

9.1 The Integrative Data Analysis Strategies

There are certain strategies that can facilitate data integration. Most of these strategies are similar to those of Plano Clark et al. (2013), who also used an embedded mixed methods design, with the exception of the use of a pragmatic approach to data analysis and the meta-inferences drawn from all the data. There are a total of six strategies for data integration.

9.1.1 Build on Previous Research Studies

Before designing a study, a review of the literature can provide a better understanding of how other researchers have conducted similar research in the same field. As noted above, there have been many studies on LLS and SI using mixed methods designs whereby rich and detailed data might have been generated (e.g. Fan 2010; Hong-Nam and Leavell 2011). Thus, framing the present study according to a mixed methods design might help further understand students' LLS and the effects of SI in the current context. With the goal of reaching a comprehensive understanding of LLS in the first phase, the initial plan called for the use of

mixed methods design, followed by the use of embedded mixed methods because this design could enable full coverage of the phenomenon under study, particularly when both qualitative and quantitative data were integrated for meta-inferences. This design also served the three purposes aims of triangulation, development and expansion, and closely followed the pragmatic approach. Equipped with a more complete understanding of students' LLS, the embedded quasi-experimental phase of SI in the second phase could be conducted to further expand on the understanding of the effects of SI, especially by integrating data from various research instruments.

9.1.2 Gather Sufficient Data

It is helpful to gather sufficient data without sacrificing undue time and resources. When conducting mixed methods research, there is a need to collect various data from different instruments in order to understand the phenomenon of interest. However, time and resources must be utilized prudently so that comprehensive data can be gathered in the most efficient manner. In the first phase of this study, there were four sources of data (the SILL questionnaire, the student background questionnaire, group interviews, and observations). Quantitative data were gathered from both the SILL and background questionnaires from all nursing students at the institution (i.e. the entire population of 208 students). Qualitative data derived from six hours of video/audio recording from a subsample of the population (eight students from each of the high, medium, and low proficiency groups from two second-year classes), and weekly observations were undertaken by the researcher vis-à-vis two second-year classes (N = 47) over a period of eight weeks for a total of 32 hours. Due to the large volume of qualitative data, the LLS used and the main ideas in the group interviews were transcribed and translated, and the observation checklists (Oxford 1990) were reduced to frequencies for comparison purposes.

In the second phase, another four sources of data (group interviews, observations, diary entries and the SILL questionnaire) were used. Group interviews of three students, each from the high, medium and low proficiency groups, conducted before and after SI constituted a total of six hours. Weekly observations were undertaken by the researcher for the treatment group (N = 23) over a period of eight weeks for a total of 16 hours. Diaries were collected from students in the treatment group every week for eight weeks. The SILL questionnaires were filled in by both the treatment and comparison groups before and after strategy instruction (N = 47).

On account of time constraints (due to the use of one semester for data collection in each phase) and limited resources, the use of four instruments in each phase constituted the maximum that could be handled by the researcher. However, using a variety of instruments allows the weaknesses in each instrument to be compensated for by the strengths in others. For example, the data extracted from the group interviews might not be generalizable, but this weakness could be overcome by the structured questionnaires, while the use of observations could provide more objective data concerning students' LLS than the questionnaires.

With the use of four instruments in each phase, the LLS of the nursing students and the effects of SI on students' LLS were thoroughly examined. Thus, maximizing the time and

resources efficiently was of paramount importance in order to gather sufficient data.

9.1.3 Analyse the Data from Each Instrument Separately at the Outset, i.e. before data integration

When performing the initial data analysis, it is helpful to analyse the data collected via each instrument separately because it enables a thorough initial understanding of each data set without combining data generated by separate instruments. For example, when analysing the student background questionnaires, content analysis was used for the 24 selected students (for group interviews) and to search for differences within the high, medium, and low proficiency groups. The SPSS (version 20) software program was then used to process the quantitative data (including descriptive statistics, analysis of variance (ANOVA), cross tabulations, and the Mann-Whitney U and Kruskal-Wallis tests) on all nursing students' use of LLS and to analyse how different learner variables could affect their use of LLS. After a comprehensive examination of the student background questionnaires, these data could be juxtaposed with the reduced and summarized data from another instrument for comparison and integration. In the first phase, the data from the SILL and background questionnaires were integrated with the qualitative data from the group interviews and observations for the purpose of merging them into case studies. After that, further inferences based on the integrated data (the case studies) could be made and used in planning the SI in phase two.

In phase two, similarly, each instrument was analysed separately in order to understand the effects of SI on the students' LLS. For example, the group interviews were analysed and summarized according to high, medium and low proficiency (as proficiency could affect students' LLS use). Details of the modifications in LLS were discussed before and after SI. Further, the results of the class observations and diary entries were discussed through content analysis. Subsequently, the modifications in the students' LLS use, calculated by both independent samples t-tests and paired sample t-tests, were used to examine the changes in students' SILL scores before and after SI for both groups in order to compare students' modifications in LLS use both between and within the treatment and the comparison groups after SI (within groups for assessing the time effect on their LLS modifications). Analysing each data set separately enabled a complete and in-depth understanding of each, without sacrificing their significance before each data set was integrated to achieve a broader picture of the phenomenon of interest.

9.1.4 Use a Pragmatic Approach for Data Analysis

This research design was shaped by a pragmatic approach. The abductive, intersubjective and transferability approaches (Morgan 2007) for looking back and forth into each data set and summarizing the integrated data helped in arriving at the best possible explanation for the phenomenon under study. In abduction, researchers are required to reflect on various data collected from each instrument, offering them excellent opportunities to reflect and work back and forth between the quantitative and qualitative approaches (*ibid.*). For example, in phase one, some commonly used strategies were noted in the students' background questionnaires (Table 1, first column). These strategies could subsequently be further validated from the group interviews (second column). The number of similar strategies could

be calculated based on the interview material and compared with those strategies gathered in the questionnaires. Further, when noting the most commonly observed strategies in the classes (third column), the SILL questionnaires could be used to evaluate whether these were indeed their most frequently used groups of strategies (fourth column). Adopting this approach, a table summarizing the Chinese nursing students' use of LLS was generated, showing all the relevant qualitative and quantitative data side-by-side for comparison purposes (given that the qualitative data were quantized). Table 1 summarizes all the main strategies used by these students, using the quantitative data collected from the student background questionnaires combined with the relevant qualitative data from the interviews, the strategies observed in the SI classes and the corresponding scores from the SILL, and by abductively reflecting on each data set. (Similar strategies were used to generate Table 2 to summarize the students' modifications in LLS before and after SI; due to the limited extent of this paper, only the memory-related group of strategies are presented, and Table 2 is discussed in connection with the next strategy) (see footnote iii).

By working abductively with different data gathered with various instruments, the researcher could induce and deduce whether these strategies were indeed the most commonly used ones. Based on the pragmatic approach, the researcher could take the LLS highlighted through one method and make the best possible use of that knowledge in another situation. For example, after learning from both background questionnaires and group interviews that certain strategies were used, it was also possible to use the observational data to evaluate whether this was indeed the case in the researcher's own English classes. Finally, embracing a 'reflexive' orientation from the pragmatic approach (Morgan 2007, 71) enabled the researcher to reflect on the study in order to understand whether the results were concordant with or in conflict with her field of interest. When in conflict, she could reflect abductively on the data gathered in order to understand the phenomenon. Researchers in other fields could adopt a similar approach when analysing data. Using a pragmatic approach explicitly could support a better understanding of the phenomenon in hand, as data are induced and deduced back and forth before a final decision is made.

Table 1. Summary of main strategies used in phase one

Student background questionnaires (N = 208)		Interviews (N = 24)	Observations (N = 47)	SILL average group scores and corresponding items with scores (N = 208)[i]
Quantitative		Qualitative	Quantitative	Quantitative
Main strategies revealed in student background questionnaires	N	Corresponding strategies in interviews	Corresponding strategies from observation checklists	Corresponding average score for the group(s) of strategies and the corresponding items with scores
Using dictionaries (44.3%); surfing the	24	Using dictionaries;	Using resources	Average score for cognitive group =

Internet (42.9%); watching English movies/DVDs/audio-visual media (47.1%); listening to or singing songs/music (67.8%); remembering/using grammatical rules (36.9%)	17 16	surfing the Internet; listening to songs; watching English TV and movies; remembering/using grammatical rules	(>80%); formally practising with sounds and writing systems (>80%)	2.82; I practice the sound of English = 3.00; I watch English language TV shows spoken in English or go to movies spoken in English = 3.32; I read for pleasure in English = 2.40; I write notes, messages, letters, or reports in English = 2.61
Remembering/reciting vocabulary (43%); remembering pronunciation by association (36.3%); listening to key words (55.7%)	24 13 12	Remembering/reciting vocabulary; remembering pronunciation by association; listening to keywords for things that are not understood	Associating and placing new words into a context (>80%); using key words (>80%); representing sounds in memory (>80%)	Average score for memory-related group = 2.33; I use new English words in a sentence so I can remember them = 2.65; I connect the sound of a new English word and an image or picture of the word to help me remember the word = 2.72; I remember a new English word by making a mental picture of a situation in which the word might be used = 2.40
Obtaining help from others (36.9%); guessing intelligently (36.2%)	19 11	Obtaining help from more proficient classmates or friends; guessing from the context	Guessing intelligently (>80%); obtaining help (>80%)	Average score for compensatory group = 3.07; to understand unfamiliar English words, I make guesses = 3.61
Listening to teachers carefully (in class) (48%)	14	Listening to teachers carefully (in class)	Paying attention (>80%)	Average score for metacognitive group = 2.70; I pay attention when someone is speaking English = 3.59

9.1.5 Focus on In-Depth Data Analysis and Meta-Inferences from all the Data

Using a pragmatic approach to data analysis can also enable the researcher to perform a more in-depth analysis and to draw further meta-inferences from all the data. For example, using a case study approach in the first phase can provide an in-depth description of participants' experiences and feelings in a particular situation for comparison purposes (Patton 2002), which might provide a more comprehensive portrait of students' use of LLS. After the primary data analysis of each data set, and by embedding the secondary data into case studies, further inferences might be made based on integrating qualitative and quantitative data by abductively reflecting on the knowledge acquired. The quantitative data from the SILL and student background questionnaires were merged with the qualitative data in each case study to develop an integrated analysis of each case. From a comparative examination of both the qualitative and quantitative data sources and by treating each data source in isolation and in comparison, three cases were documented and developed (Creswell and Plano Clark 2011).

This in-depth understanding of students' LLS helped shape the SI in the second phase. Thus, embedding and integrating the necessary quantitative data within the case studies provided more robust findings concerning students' use of LLS.

In the second phase, similarly, by integrating the quantized qualitative understanding of students' LLS with the quantitative data from the SILL before and after strategy instruction, students' modifications in LLS could be examined. Further, through integrating the data from both diary entries and observations, students' modifications in LLS could be monitored. By forming meta-inferences from all the data before and after strategy instruction, Table 2 summarizes the main memory-related strategies (see endnote 3) used by the students according to their diaries and through classroom observations (fourth column). The researcher could subsequently work abductively on the data extracted from the group interviews (the second column for pre-SI and the third column for post-SI) and the SILL questionnaires (fifth column) and juxtapose all modifications in memory-related strategies to form a table so that students' LLS modifications in various English skills (speaking, reading, writing and listening) could be evaluated.

Additionally, the recommendations regarding the use of SI in improving LLS in the English as a foreign language curriculum could only be made after all the data had been analysed and integrated to fully understand the effects of SI on the students' use of LLS, their learning processes, and achievements. These recommendations are discussed in Chan (2014); in brief, they include pedagogical recommendations that may be used in future SI (e.g. the level of difficulty of the tasks must be appropriate for the students when applying LLS; students' interest must be stimulated when learning LLS).

In applying this strategy in other fields of interest, forming similar tables for in-depth data analysis and drawing meta-inferences from all the data, other recommendations for conducting educational research in various fields can be enhanced.

Table 2. Summary of modifications in LLS use in the treatment group for memory-related strategies before and after SI (speaking; *reading*; writing; listening)[ii]

	Before SI	After SI		
	Group interview (N=12)	Group interview (N=12)	Diaries (with observations incorporated) (N=23)	Adapted SILL (N=23 treatment group; N=24 comparison group)
Memory-related strategies	Qual Using key words (4, somewhat); representing sound in memory (2, somewhat); associating new words in a context (2, somewhat); using flash cards (1, somewhat); grouping (2, somewhat)	Qual **Using imagery (3, somewhat); grouping (2, somewhat); employing action (1, quite a lot)** *Using key words (1, quite a lot; 1, somewhat); grouping (1, somewhat); using imagery (1, somewhat)* Semantic mapping (4, quite a lot; 1, somewhat); grouping (3, somewhat); using imagery (3, somewhat) Using imagery (6, somewhat); grouping (1, somewhat); semantic mapping (1, somewhat); representing sound in memory (2, somewhat); associating new words in a context (1, somewhat)	Qual **Using key words (1); grouping (1); using imagery (1)** *Using imagery (1); associating new words in a context (1); semantic mapping (3); grouping (1); using key words (1); reviewing well (observed >80%)* Semantic mapping (8); using imagery (5); grouping (3); reviewing well (observed >80%); associating new words in a context (observed >80%) Using key words (2); grouping (1); semantic mapping (2); using imagery (3); associating new words in a context	Quan Pre- and post-test paired samples t-test showed statistically significantly increased in the mean score. (Pre-SI: M=2.25, SD=0.53; post-SI: M=2.81, SD=0.55) t=-5.48, two tailed ρ<.0005; Cohen's *d*=0.76

(observed >80%)

9.1.6 Develop an Emerging Approach to Data Analysis

When conducting research in different fields, researchers may develop numerous approaches to facilitate data analysis. For example, Basit (2003) combined two strategies in coding her qualitative data, including forming themes and adding appropriate quotations from interviews.

In this study, three approaches emerged, comprising the use of coloured pens, reducing the data as soon as possible, and the continuous application of a pragmatic approach. Firstly, the use of coloured pens: As a result of the large volume of qualitative data, the major ideas and the use of LLS were highlighted using six different coloured pens. As there were six LLS groups in Oxford's (1990, 2001) classification (see endnote 3), each group was circled with a different coloured pen for easier identification. These groups could then be quantized to obtain a better understanding of the subject under study (e.g. which LLS groups were used most often and, in each case, how often).

Secondly, reducing the data as soon as possible: For qualitative data purposes, for example, after each group interview, the data were immediately reduced while details were still fresh in the researcher's memory. Observational data were quantized for easier identification, and diaries were systematically analysed each week. For quantitative data purposes, they were also analysed by the SPSS as soon as possible so that comparisons and further analysis could be carried out. In light of the large volume of data in mixed methods research, all these steps were necessary to ensure a smooth reduction of data for data integration.

Lastly, the continuous application of a pragmatic approach: After analysing and integrating all the data collected and after presenting a complete picture in the case studies, it was necessary to continue in order to search for a further layer of inferences that could possibly be drawn based on this picture, namely via the use of abductive and intersubjective approaches. By comparing and contrasting the data, by looking for similarities and differences (particularly among the three proficiency groups), and by asking questions regarding what, why, and how students' LLS changed during the semester, a more nuanced understanding could be acquired. For example, a comparison of the three case studies with the learning environment – and the high school environment in particular – might affect how well the students learned English. Thus, a broader and deeper understanding of the phenomenon could be acquired by adopting an explicit pragmatic approach to data integration at the analytical and interpretation level.

In summary, the first five strategies discussed were in chronological order while the last strategy concerning emerging approaches could be developed throughout the whole data integration process. Thus, researchers in different fields could develop other suitable strategies for facilitating data integration when conducting mixed methods research. To this end, using meta-inferences from all the data gathered could provide useful recommendations in other educational research in various fields.

10. Conclusion

Social phenomena can be understood more comprehensively if the data gathered are utilized to their full potential. This paper discussed six strategies used in data integration during the analytical and interpretation levels, expanding the strategies discussed in Plano Clark et al. (2013) by using an explicit pragmatic approach and by forming meta-inferences based on all the data gathered. Although this study only focused on one area of research in applied linguistics, the same or similar strategies can be applied to various areas within the same field, or may even be extended to other fields when conducting mixed methods research.

From a pragmatic perspective, research is a form of action for meeting our goals of understanding our interests (Morgan 2013). This paper detailed the use of a pragmatic approach to planning the present study and, most importantly, highlighted the way in which such an approach can enhance data integration strategies. A pragmatic approach provided the rationale for adopting mixed methods research in the first instance, and the understanding of the phenomenon under study that was acquired was the most significant issue that this approach helped to elucidate. This approach also highlighted 'the connection between the context and one's experiences' (Hall 2013, 22) because LLS are context-specific and students' experiences concerning their use could be thoroughly understood thanks to mixed methods. Further, this study showed how the use of this type of approach was implemented in the two phases, and the strategies applied in data integration were then fully presented. Using an embedded mixed methods design with a pragmatic approach, a comprehensive picture of the students' LLS and the effects of SI could be evaluated using Morgan's (2007) abductive, intersubjective, and transferability approaches, which ensure a thorough and full utilisation of data during the data integration process.

Endnotes

1. Language Learning Strategies (LLS) consist of 'steps or actions that a learner consciously takes to improve and regulate his or her language learning' (Oxford, Griffiths, Longhini, Cohen, Macaro, & Harris 2014, 11).
2. Strategy Instruction (SI) involves teachers directly teaching language learning strategies (LLS) to students in classrooms (Cohen 2011, 116).
3. There were six LLS groups in Oxford's (1990, 2001) classification (memory-related, cognitive, metacognitive, compensatory, social, and affective).

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[i] 3.5 to 5 are regarded as high; 2.5 to 3.4 are regarded as medium and 1.0 to 2.4 are regarded as low LLS use (Oxford, 1990).

[ii] '1' stands for the number of student(s) using the strategy (out of a total of 12 students from the high, medium and low proficiency groups). 'Somewhat' indicates how much or how often they used each strategy (ranges from 'very little', 'little', 'somewhat', 'quite a lot' and 'a great deal').