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ARTICLE

Autonomy CALLing: A systematic review of 22 years of publications in learner autonomy and CALL

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Abstract

While research on language learner autonomy and Computer-Assisted Language Learning (CALL) is abundant, few studies have sought to systematically explore the relationship between the two. By adopting a rigorous approach that identifies transparent inclusion and exclusion criteria, this paper presents a systematic review that seeks to identify: (a) the scope of interest, (b) features, and (c) the trends that emerge at the intersection of the empirical research on learner autonomy and CALL. A dataset comprising of 41 research articles published over a span of 22 years was coded and quantified, with the data extracted, then compared over two distinct periods, 1997 to 2010 and 2011 to 2020. Results show that there is a significant increase in the number of participants targeted for studies, which are situated in non-formal and informal learning contexts with an unstructured degree of formality. Moreover, online applications, such as social media and downloadable apps, seem to be favored and can be directly linked to the ubiquitous autonomous learning experience through either mobile-assisted language learning or informal learning.

Keywords: *Systematic Review, Learner Autonomy, Computer-Assisted Language Learning, Informal Learning*

Language(s) Learned in This Study: *Arabic, Chinese, English, French, German, Japanese, Korean, Italian, Turkish, Polish, Portuguese, Russian, Spanish*

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Introduction

No literature on language learner autonomy is complete without a passing reference to Henri Holec's definition of autonomy. Although researchers in the field may unanimously cite autonomy in the words of Holec (1981, p. 3) as "[taking] charge of one's own learning", the "capacity" to do so comes from Little's, (1991, p. 4) addition of a psychological element to complement Holec's basic definition. Learner autonomy, however, is a much richer, "multi-dimensional concept" (Lai, 2017, p. 6) which could be interpreted as not just "the situation in which the learner is totally responsible for all the decisions concerned with his learning and the implementation of those decisions" (Dickinson, 1987, p. 11) but also as "a capacity and willingness to act independently *and* in cooperation with others, as a social, responsible person" (Dam et al., 1990, p. 102). This is probably the reason why researchers (like Benson, 2011a; Huang & Benson, 2013; Schwienhorst, 2008) deem it undesirable to define the concept as it may very well take different forms, depending on the individual's personality type and/or contextual and temporal factors.

The relationship between learner autonomy and Computer-Assisted Language Learning (hereafter CALL) has been extensively explored in the field of language learning and teaching. Already in 2005, Blin applied an activity theoretical approach to study how CALL could potentially foster the development of learner autonomy. The various papers published in the 2011 Special Issue of the journal *Language*

Learning & Technology on Learner Autonomy and New Learning Environments focus on how CALL environments may be harnessed to focus on learner autonomy through various task-based projects. Reinders and Hubbard (2013) focus on the "potentially symbiotic relationship" (p. 359) between the fields of autonomy and CALL by identifying the various affordances and constraints of technology that could impact learner autonomy. More recently, Reinders and White (2016) have sought to provide a narrative overview of the relationship between CALL and autonomy, with special focus on the themes that have emerged in the literature over the course of 20 years. Continuing the research on the relationship between learner autonomy and CALL, for the purposes of the present study, we have adopted a "systematic review approach" that will serve to underline what transpires at the intersection of the fields of learner autonomy and CALL.

Conceptual Framework

While the origins of the term CALL are not as clear, the history of CALL has been well documented through methodological approaches (see Butler-Pascoe, 2011; Levy, 1997, etc.). In their chapter on the historical perspectives on CALL, Davies et al. (2013) posit that the earliest documented use of the term CALL is in a 1981 conference paper by Graham Davies and David Steel. By the following year, the term was in widespread use in the United Kingdom, with *TESOL* adopting the term and setting up its CALL interest section in 1983 (Kenner, 1996). One might argue that the foundation of CALL should rather be linked to the creation of the professional association *CALICO* (Computer-Assisted Language Instruction COnsortium) in the United States in 1982. While this might be true, CALL tends to reflect "a student-centred focus on learning rather than instruction" (Davies et al., 2013, p. 20).

When CALL began to reach a wider audience in the 1990s, Warschauer (1996) and Warschauer and Healey (1998) identified three "phases" of CALL suggesting that one phase led to another. *Behaviourist CALL*, conceived in the 1950s and implemented in the 1960s and 1970s gave way to *Communicative CALL*, which became prominent in the 1970s and 1980s and led to *Integrative CALL* in the mid-1990s. Bax (2003) offers a critical reassessment of this history, describing and defining three "approaches" to CALL that he names *Restricted CALL*, *Open CALL*, and *Integrated CALL*. Restricted CALL is somewhat similar to Warschauer and Healey's (1998) Behaviorist CALL, though as Bax (2003) points out, while the actual software, task types (such as closed drills and quizzes), teacher's role (to monitor) and feedback are not necessarily behaviorist, they are nonetheless quite "restricted" in nature. By Open CALL, Bax (2003) refers to the openness of the various dimensions of teaching and learning: feedback given to the learners, the types of tasks (simulations, games, CMC), and roles of the teacher (monitor/facilitator). Finally, Integrated CALL refers to technology being integrated into the teaching curriculum to such an extent that the use of it becomes as "normalized" (Chambers & Bax, 2006) as the use of pen and paper. The author argues that Integrated CALL should be considered as an "aim towards which we should be working" (Bax, 2003, p. 22).

Historically speaking, research on learner autonomy has also evolved with time. In its nascent years (1970-1980), the idea of autonomy was essentially linked to individualized learning (Brookes & Grundy, 1988), as self-access language learning centres[1] gradually became the "context for the exercise of learner autonomy" (Blin, 2005, p. 13). During these years, learning was considered to be a personalized form of instruction and while learners might have been "granted" the autonomy to learn at their own pace, they did so by leaning heavily on the resources suggested or provided by their teacher or as they later came to be known, language advisor (see Ciekanski, 2007).

Gradually, this individualized form of instruction came to be placed in conjunction and contrasted with *self-directed learning*, which could be defined as:

> A process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies, and evaluating learning outcomes (Knowles, 1975, p. 18).

The concept of autonomy has been, and continues to be, fraught with contradictions and semantic conflict (Oxford, 2003). For Dickinson (1987), learner autonomy refers to a "learning situation," while self-direction is the "attitude of responsibility". In contrast, for Holec (1979), autonomy is "the learner's ability to be responsible for his/her learning," while self-direction is the "learning situation or mode". Furthermore, Benson (2011a, p. 10) views autonomy as "a natural product of the practice of self-directed learning". In order to sort out the ambiguous and conflicting framework of learner autonomy, two complementary models were explored for this study. The first one is Benson's (1997) model of learner autonomy that contains three "versions" of autonomy, that are (a) technical, encompassing situational conditions for autonomy; (b) psychological, involving the individual's characteristics, such as attitudes and behaviors; and (c) political, as in dealing with competing ideologies. The second is Oxford's (2003) systematic model that uses Benson's model as a stepping-stone to propose a fourth (sociocultural) perspective on autonomy which focuses on mediated learning. A sociocultural perspective of autonomy identifies autonomy as a social construct that can be developed through the processes of interdependence and collaboration (Kalyaniwala, 2018; Murray, 2014). In other words, a learner can only be autonomous in relation to some social context. This might be achieved by interacting with others through the means of a "dialogic construction of knowledge" (Little et al., 2017, p. 44) and thus incorporated in classroom-based instruction (such as Dam, 1995; Miller, 2007).

Ten years after the publication of Knowles's (1975) seminal work, Riley (1986) suggested that an autonomous learner needed to reject institutional protocol and instead, follow their own learning methods. This difference between individualized instruction and self-directed learning that rejects institutional instruction probably lays the conceptual foundation for the dialectical relation between "formal", "non formal" and "informal"[2] learning (see Lee, 2019; Sockett, 2012; Sockett & Toffoli, 2012). Benson (2011b) proposes "a somewhat rudimentary framework" (p. 15) in better understanding what he calls the four dimensions of autonomy. These dimensions have been summarized in Table 1 below:

Table 1

Benson's (2011b) Table Reprinted in Reinders and Benson (2017)

Dimension	Description	Terms
Location	Where and when the learning takes place	Out-of-class, after-class, extra-curricular, self-access, out-of-school, distance
Formality	The degree to which learning is linked to educational qualifications or structured by educational institutions	Informal, non-formal, naturalistic
Pedagogy	The degree to which teaching is involved	Non-instructed, self-instructed
Locus of control	How decisions are distributed between the learner and others	Autonomous, independent, self-regulated

A common misconception was, and continues to be among certain circles, that with rapidly advancing technology, a learner will automatically become autonomous. This misconception is often accompanied

by the continually growing apprehension that technology will somehow be able to replace teachers as it single-handedly provides learners with the tools to control their own learning (Levy, 1997; Reinders & Hubbard, 2013). We do not have any intention of fueling the debate with this paper. We are however interested in understanding how researchers working with CALL apply the construct of learner autonomy.

Our systematic review will serve to answer the following research questions:

1. What has been the scope of interest of the empirical research that lies at the intersection of learner autonomy and CALL from 1997 to 2020?
2. What are the features of such empirical research in the journals under study?
3. What trends emerge from a systematic study of empirical research into the fields of learner autonomy and CALL?

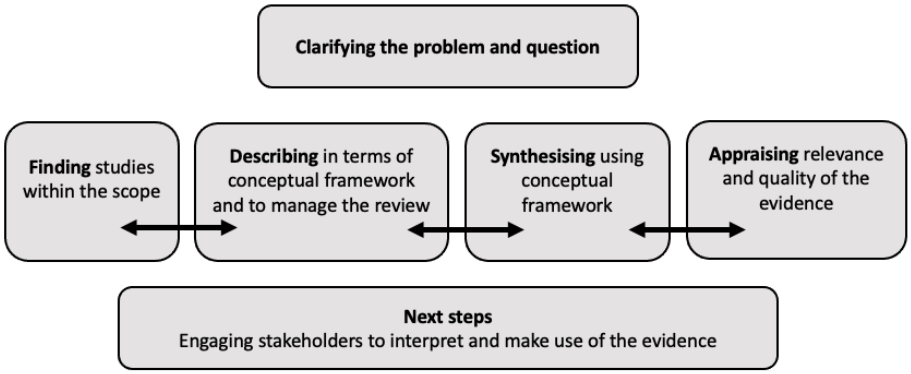
Methods

What is a Systematic Review?

A systematic review can be defined as "a review of existing research using explicit, accountable, rigorous research methods" (Gough et al., 2017, p. 2). It could also be considered as "secondary level analysis" (Newman & Gough, 2020, p. 4) since it uses the findings of primary research to answer a research question. The main difference between a systematic review and a traditional narrative literature review is that the latter is usually used to address topic areas, whereas a systematic review is focused on answering a research question. A narrative literature review is best used to theoretically situate the author of a given piece of research into the study. A reinterpretative approach underlines a narrative review, and its purpose is to generate a hypothesis. A systematic review, on the other hand, makes it possible for a researcher "to gain an understanding of the breadth, purpose and extent of research activity in a given area" (Gough & Thomas, 2017, p. 56). Using such an approach, researchers are in a better position to identify the characteristic features of the subject under question and analyze their findings with some authority by making transparent the relative strengths and weaknesses of the research in question. A systematic review offers a multiple-step approach (see Figure 1, reproduced from Gough et al., 2017, p. 16) that helps guide the researcher towards informed evidence.

Figure 1

Stages of the Review Process Represented by Gough et al (2017, p. 16)



The methods used to bring together or synthesize the findings from primary research might be placed on a continuum between approaches that aim to "aggregate" or "configure" findings of studies (Gough et al.,

2017, p. 7). Aggregative methods of analysis often "use quantitative, pre-specified methods", whereas configurate methods "address more open questions that explore and explain variation in study findings … bring[ing] together qualitative data" (Gough et al., 2017, p. 7). For the purposes of this review, we have employed mixed methods to better chart out the multifarious elements (research foci, methodology, learner profiles) that lie at the intersection of learner autonomy and CALL research.

Finding Studies Within the Scope

To identify relevant studies for the purposes of the present study, it was important to focus on four factors: the choice of journals where our corpus could be extracted from, a consistent timeframe that would take into account published research, appropriate keywords that would help in identifying the studies, and rigorous inclusion and exclusion criteria that would help in choosing the relevant studies.

We had a very wide variety of published research (books, journals, Ph.D. and Master's dissertations, and individually published papers on blogs) at our disposal that dealt with both autonomy research and CALL. Although it was very tempting to conduct a comprehensive study that took into account all the published research, we chose to restrict our study to four major journals with high impact factors (ImF) as of 2018 in the field of language learning and CALL: *Language Learning & Technology* (ImF=2.571) that will henceforth be acronymized as *LLT*, *Computer Assisted Language Learning* (ImF=2.018) that will henceforth be acronymized as *CALL-J*, *System* (ImF=1.930) and *ReCALL* (ImF=1.371).

To objectively analyze the distribution of studies (Figure 2), it became necessary to identify a relevant timeframe that considered published research in the four journals over the same duration. Although *CALL-J* was launched in 1990, the year that *LLT* was first published (1997) was chosen so that the same timeframe of published research could be maintained across the four journals.

Identifying appropriate keywords that would help in selecting relevant studies was difficult. We first decided to investigate research published in the journal having the highest impact factor *(LLT)* and once the keywords had been identified, we applied our search to the other three journals. At the onset of our search, *autonom** seemed to be the obvious keyword choice. However, we were of the opinion that by restricting the field of search to the one keyword, a wide range of quality papers calling autonomy by another name would be excluded. We thus chose to conduct a more generalized search in *LLT* using *self-directed learning*, *self-access*, *self-efficacy*, *empowerment*, and *independent learning*.

This initial phase of search posed two challenges. Firstly, the term 'self' brought up a wide range of articles that did not concern self-direction, such as self-correction. Even after excluding studies that had nothing to do with autonomy, a very large dataset was identified within the scope of *LLT* (*n*=222). When added up with references from other journals, this would give us an impossibly large dataset to deal with for the purposes of just one paper. Secondly, three distinct categories of papers emerged:

1. Wherein learner autonomy was identified as the main objective of study (e.g., Fuchs et al., 2012);
2. Wherein autonomy research served as a backdrop to the main subject under study (e.g., Chambers, 2005);
3. Wherein the term *autonomy* or other forms of autonomy were generically employed once, twice or even a few times within the paper but without them being defined or explained in any way (e.g., Cutrim Schmid & Whyte, 2012).

Although identifying these categories was an interesting finding, we became aware that it would be very difficult to conduct a systematic review of the literature with such a heterogenous group of variables. Since our objective was to trace the evolution of autonomy research with respect to CALL, we chose to apply a *purposive searching* approach[3] (Brunton et al., 2017, p. 101) that is generally suited to reviewers who wish to restrict the number of studies to capture all the relevant perspectives pertaining to the research question.

Thereafter, we chose to deliberately limit our inclusion criteria and applied solid exclusion criteria to our

second search. The criteria applied to all the four journals have been summarized in Table 2.

Table 2

Inclusion and Exclusion Criteria

Inclusion criteria	Exclusion criteria
The nature of the study is empirical[4].	Commentaries (e.g., Godwin-Jones, 2016), meta-analyses (e.g., Plonsky & Ziegler, 2016), overviews and narrative literature reviews (e.g., Reinders & White, 2016)[5].
It is published between 1997 and 2020.	Studies dealing with mechanisms or strategies for fostering learner autonomy, such as self-regulation (e.g., Polat et al., 2013) and learner agency (e.g., Vazquez-Calvo et al., 2019) without considering their relationship to learner autonomy and CALL[6].
It identifies autonomy or self-directed learning (and CALL[7]) as the principal objective of the study.	Studies dealing with the features of language acquisition and learning through CALL (e.g., Tanner & Landon, 2009).
It investigates or includes some form of IT technology within the methodological scope of the study (e.g., web resources, digital tools, social media, CMS, language learning programs, 3D environments, and so forth), either exclusively or in conjunction with other forms of face-to-face teaching in the classroom.	Studies dealing with assessment and CALL research (e.g. Arispe & Burston, 2017).

The application of these criteria yielded a dataset of 41 studies. Once the studies had been identified (see the Appendix), they were collated to a spreadsheet by the year of publication. Each study was attributed a unique identification number (ID1, ID2, and so on). Once the descriptive categories were identified, the studies were coded on the same spreadsheet[8] to give us an overview of the existing literature. To help the reader distinguish between our bibliographic references and references from our corpus, we will be referring to these ID numbers when we mention a study originating from our corpus.

Describing in Terms of Conceptual Framework

Descriptive coding was applied to the corpus in two distinct stages. In the first, publication data pertaining to the year of publication, author(s), journal of publication, title of the paper, abstract, and keywords (wherever applicable) was applied. In the second stage, we identified elements that would help us better understand how the fields of autonomy research and CALL have influenced one another. To this end, we sought to conduct three enquiries, which pertained to (a) the research methods retained by the authors of our study; (b) the population data identified in the dataset; and (c) the pedagogical settings employed by the authors in their empirical research. A content analysis method (Bardin, 1998) was used to extract relevant data and then appropriately coded. Two methods were used to code the data: (a) codes that were derived from the data itself, and (b) codes that were extracted from the conceptual framework of this paper and applied to the dataset (see Table 3). In order to analyze the trends over 22 years of research, a

simple trends analysis was conducted by calculating and comparing the results obtained before 2010[9] and after. The rationale for selecting characteristic features to conduct these three enquiries along with their descriptions and descriptive codes allotted to the dataset and examples (in parenthesis) are presented in this section.

Research Methods

Identifying the research foci used by researchers of learner autonomy and CALL provides a birds-eye view to the 'savoir-faire' of the methods used by the researchers. By research methods, we will be referring to the type of empirical study and the type of data that was analyzed in the study. Four types of mutually exclusive research methods (see Table 3) were identified and coded: action research (ID-2), case study (ID-1), experimental study (ID-17), and quasi-experimental (ID-41); as well as three types of data: qualitative (ID-1), quantitative (ID-2) and mixed (ID-4).

Population Data

Data pertaining to the target population identified in each of our 41 studies was then extracted, namely the proficiency level of the targeted population, learner academic profiles, languages learned and the number of participants in the study. If the proficiency level (elementary [ID-31], intermediate [ID-14], upper-intermediate [ID-18], and advanced [ID-4]) was not clearly mentioned by the author(s), the study was coded as 'not mentioned' (ID-1). Moreover, wherein the study targeted a heterogenous group of learners with varied proficiency levels, it was coded as 'multi-level' (ID-7).

Learner academic profiles refers to the academic level at which the targeted population was enrolled. Besides undergraduate (ID-1) and postgraduate learners (ID-21), pre-service teachers (ID-5) and continuing education (ID-20) were also identified. When the study mentioned multiple types of academic profiles, it was coded as mixed (ID-7).

The various languages learned in the studies were also coded as well as the number of participants in each study. As for the latter, it was difficult to group the number of participants in each study. A random scale was thus proposed, namely studies which targeted 1-50 participants (ID-24), 51-100 participants (ID-17), 101 to 300 participants (ID-36), 301 to 500 participants (ID-39) and 500+ participants (ID-35).

Pedagogical Settings

In order to identify the attributes and trends of the empirical studies included in this systematic review, descriptors were identified both from the corpus and from our conceptual framework (see Table 3). The characteristics of the research we focused on were Bax's (2003) approaches to CALL, learning contexts (Sockett, 2012), degree of formality (Lee, 2019), location (Benson, 2011b), skills and competencies targeted, and the CALL tools applied in the research.

The last two categories were coded with descriptors identified from within our corpus and contrary to the four previous categories, were not mutually exclusive. By language skills (ID-1), we refer to listening, reading, writing and speaking (interaction and monologue); whereas linguistic competencies (ID-20) refer to the targeting of linguistic elements such as vocabulary and grammar. Intercultural competence (ID-37) was deliberately coded separately from soft skills (ID-3) such as collaboration, affective factors, teamwork, and so on. Pedagogical skills refer to those needed by pre-service teachers, which are targeted during the training sessions, such as working with classroom recordings or conducting e-interviews (ID-5). Finally, learning how to learn (ID-18) refers to skills that contribute to the development of learner autonomy, such as reflection on learning, scaffolding, and the like. The various CALL tools identified in the corpus were 3D environments (ID-17), digital games (ID-26), online applications such as wikis (ID-11), and software (ID-3).

Table 3

Coding Scheme

Features	Descriptors identified from the corpus	Descriptors identified from the conceptual framework
Publication Data		
Year of publication	1997-2019	
Journal of publication	*LLT, ReCALL, System, CALL-J*	
Research Methods		
Type of research	Action research, case study, experimental study, quasi-experimental study	
Type of data	Qualitative, quantitative, mixed	
Population Data		
Proficiency level of the learners	Advanced, elementary, intermediate, upper Intermediate, multi-level, not mentioned	
Learners' academic profile	Continuing education, mixed, postgraduate, pre-service teacher, undergraduate	
Languages learned	Arabic, English, French, German, Italian, Japanese, Korean, Mandarin, Polish, Portuguese, Russian, Spanish, Turkish	
Number of participants	1-50, 51-100, 101-300, 301-500 500+	
Pedagogical Settings		
Approaches to CALL		Restricted CALL, Open CALL, Integrated CALL (Bax, 2003)
Learning contexts		Formal, informal, non-formal (Sockett, 2012)
Degree of formality		Semi-structured, structured, unstructured (Lee, 2019)
Location	Ubiquitous language learning	Blended, in-class, out-of-class, self-access (Benson, 2011b), not mentioned
Skills and competencies targeted	Intercultural competence, language skills, linguistic competencies, soft skills, learning how to learn, pedagogical skills	
CALL Tools	3D environments, digital games, online applications, software, not mentioned	

Synthesis

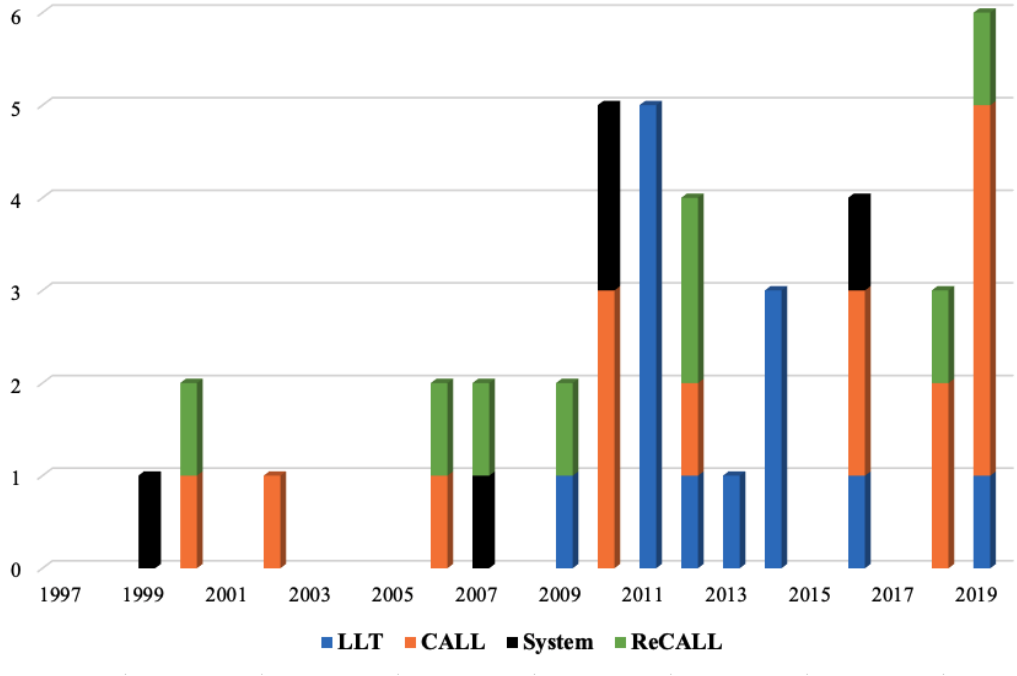
Distribution of Studies

Among the 41 journal articles published (see the Appendix) over 22 years in the selected journals, *CALL-*

J published the maximum number of papers (*n*=15; 36.5%), followed by *LLT* (*n*=13; 31.7%), *ReCALL* (*n*=8; 19.5%), and *System* (*n*=5; 12.1%). Figure 2 displays the number of yearly publications per journal. As indicated, there have been consistent publications in the combined fields of autonomy research and CALL, with a spike in the number of publications in *CALL-J* and *LLT* in 2010 and 2011 respectively and in *CALL-J* in 2019. Keeping aside the one special issue on learner autonomy and new learning environments published in 2011 (vol. 15, issue 3), the rest of the publications seem to imply a renewed interest in this combined field.

Figure 2

Distribution of Articles in Journals by Year

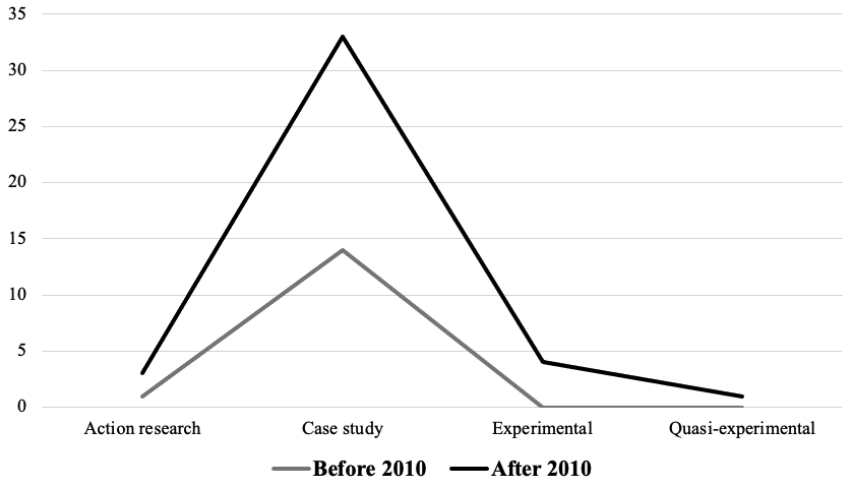


Research Methods Used in the Studies

The first enquiry was aimed at understanding the various research methods at play. Figure 3 summarizes the types of research conducted by researchers interested in the combined fields of learner autonomy and CALL. Out of the 41 studies, a majority of studies were identified by the authors of the studies as case studies (*n*=33; 80.4%). After 2010, there are three (ID2, ID16, ID21) action research studies (7.3%) and four (12.19%) experimental studies published. Only one study (2.4%) was identified as quasi-experimental in nature, which is also published after 2010.

Figure 3

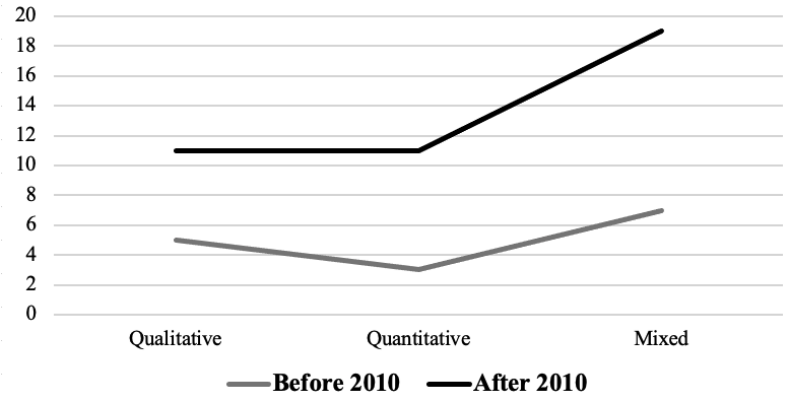
Types of Research on Autonomy and CALL



As shown in Figure 4, both qualitative and quantitative (*n*=11 each; 31.7%) types of data are equally favored by researchers of our dataset, while 46.3% of studies analyzed (*n*=19) call upon mixed data to research learner autonomy and CALL. There is a distinct rise in the number of quantitative (+12.2%) and mixed research studies (+12.13%) since 2010.

Figure 4

Types of Data used for Research in Learner Autonomy and CALL



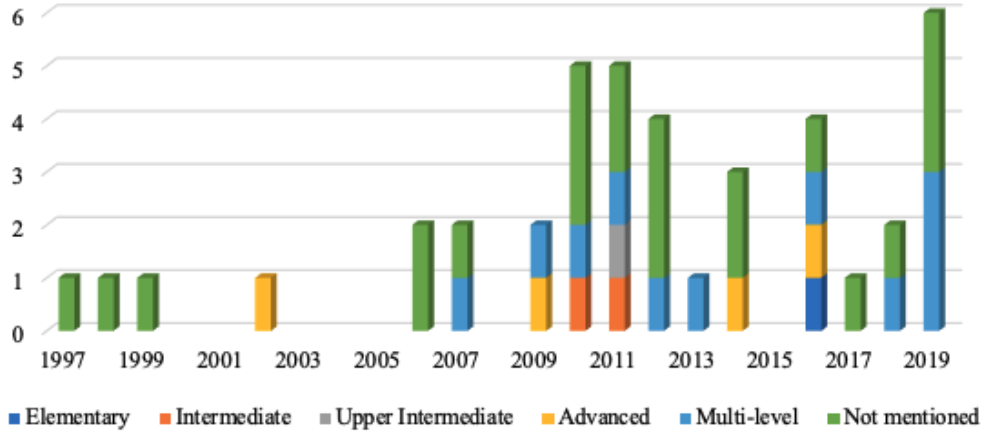
Synthesis of Population Data

Four criteria concerning the target population were retained: (language) proficiency level of the population, their academic profiles, languages learned, and the number of participants targeted by each study. The criterion proficiency level (see Figure 5) has been very difficult to code for two reasons: (a) 22 studies out of our dataset (53.6%) did not specify the level of proficiency of the target learners[10], and (b) Proficiency levels are highly subjective in nature and determined by the institution awarding them. While Europe does, by and large, use the Common European Framework for Reference for Languages (CEFR), China, for instance (see ID41) uses a system of examination based on The College English Test (CET) and the Test for English Majors (TEM). Therefore, it is difficult to pin-point the learners' standardized proficiency levels across the different educational cultures and also the reason why a trends analysis has not been attempted on the criterion in question.

Out of the remaining 19 articles (46.3% of the main corpus) that clearly mention the proficiency level of the target population, only three studies (7.3%) deal with a population of beginners (elementary) and intermediate, while four studies (9.75%) focused on advanced learners of the language. 11 out of the 19 studies (26.8%) engaged learners of different levels. In the case of ID41, the study was coded as "multi-level" since both CET and TEM level students were included in the study.

Figure 5

Proficiency Language Levels of the Target Learner Population



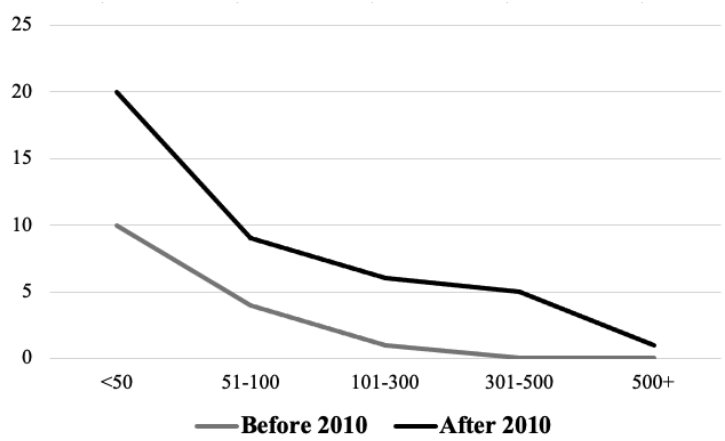
Contrary to the proficiency level of the learners, the learner academic profile is one criterion that is relatively easier to identify. Undergraduates (65.8%) seem to be the most favored population in the studies (*n*=27). Other populations include postgraduate students (*n*=3), continuing education adults (*n*=1) and pre-service teachers (*n*=4). Six studies (14.6%) were interested in mixed populations of students and teachers (ID30) for instance, or adult learners of varied academic profiles on a language learning application such as Busuu (ID-35).

As to the languages targeted in the empirical studies, English is understandably[11] the most studied language (*n*=29) within the scope of the reviewed studies, followed by Spanish (*n*=9), French (*n*=6), German (*n*=7), and Japanese (*n*=6). Other studies included Chinese/Mandarin (*n*=3) and Korean (*n*=3). Then again in studies like ID39, the author conducts a user evaluation of the mobile, online language learning application called Busuu[12] which targets several languages such as Arabic, Chinese, English, French, German, Spanish, Japanese, Italian, Turkish, Polish, Portuguese, and Russian. All of these languages were thus coded once.

Finally, as can be observed in Figure 6, a very random frequency distribution scale was applied to the dataset in order to get a general overview of the number of participants involved in each study. In our corpus, 29 studies (70.7%) deal with a population size of 100 learners or fewer, as opposed to 12 studies (29.2%) that are conducted with a population size greater than 100. Breaking these figures down even further, we note that a total of 20 studies have been conducted with fewer than 50 participants, 9 studies with a population size ranging from 50-100 participants and 12 studies account for a significantly larger population size.

Figure 6

Sample Size of the Target Learner Population



While there were only 5 studies (12.1%) taking into account more than 50 students (in each study) before 2010, a total of 16 studies (39.02%) take more than 50 students into account after 2010. This finding seems to suggest that more and more researchers are interested in developing autonomous skills in larger student populations. This trend probably also explains the relatively large number of quantitative and mixed methods studies (*n*=20, 48.7%) that are employed in studies published post 2010.

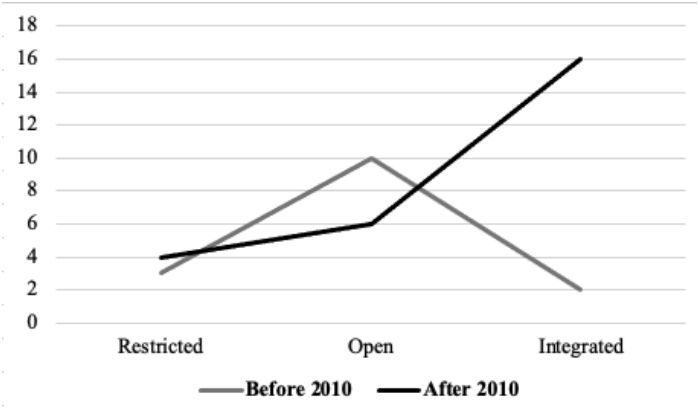
Synthesis of Pedagogical Settings Used in the Empirical Studies

The third enquiry that was conducted was with regards to the pedagogical settings in which the empirical studies were situated. The six criteria identified are: (a) approaches to CALL, (b) learning context, (c) degree of formality, (d) location, (e) skills and competencies targeted, and (f) CALL tools. This data was submitted to a trends analysis that analyzed trends before and after 2010.

Firstly, we applied Bax's (2003) proposed approaches to CALL to our dataset. It was found that 7 studies (17.07%) had a 'restricted' approach to CALL, 16 studies (39.02%) had an 'open' approach to CALL, while 18 (43.9%) had an 'integrated' approach to CALL. Figure 7 reveals an increased use of the integrated approach to CALL with 16 studies that use this type of approach as opposed to just 2 studies before 2010. While there is a slight rise in the number of studies that use a restricted approach to CALL (*n*=3 > 2010 vs. *n*=4 < 2010), there is a dip in the number of studies that use Open CALL (*n*=10 > 2010 vs. *n*=6 < 2010).

Figure 7

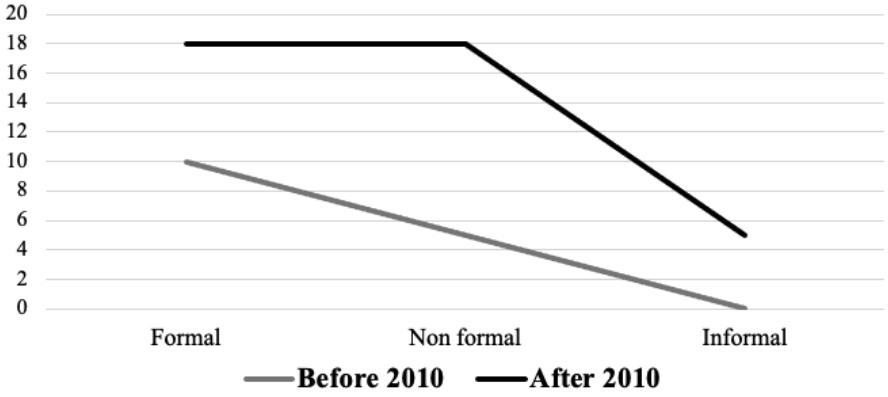
Trends in Approaches to CALL using Bax's (2003) Typology



Secondly, Sockett's (2012) three types of learning contexts (formal, non-formal and informal) were applied to our dataset (Figure 8). Non-formal learning contexts should be understood as self-study contexts outside the language classroom, where the task and/or learning objectives are pre-decided by a teacher or a counsellor. On the other hand, the locus of control in informal learning lies resolutely with the learner. The numbers of formal and non-formal learning situations are identical in number (*n*=18 or 43.9% each), whereas informal learning situations are fewer in number (*n*=5 or 12.1%). The trends analysis however reveals that there is a significant rise in the number of non-formal studies since 2010 (*n*=13 >2010 vs. *n*=5 <2010) and wherein an informal learning context study was non-existent before 2010, 5 studies have been conducted since then.

Figure 8

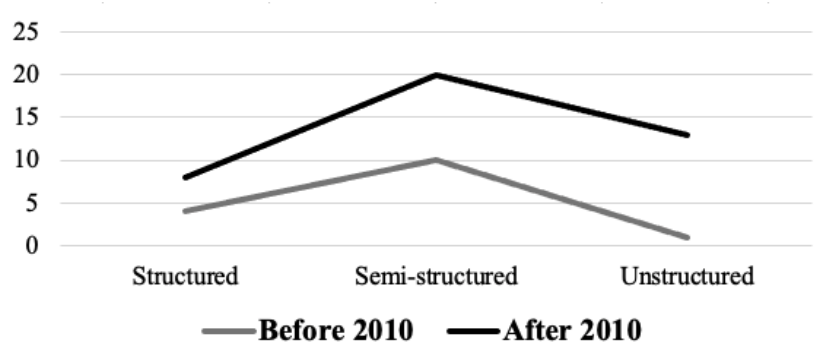
Trends in Learning Contexts



Concerning the degree of formality (Figure 9), 20 studies (48.7%) out of 41 studies were semi-structured, 13 studies (31.7%) were unstructured, and 8 studies (19.5%) were coded as structured. The most significant finding seems to be the shift towards an unstructured form of autonomous language learning (*n*=1 < 2010 vs. *n*=12 >2010).

Figure 9

Trends in the Degree of Formality

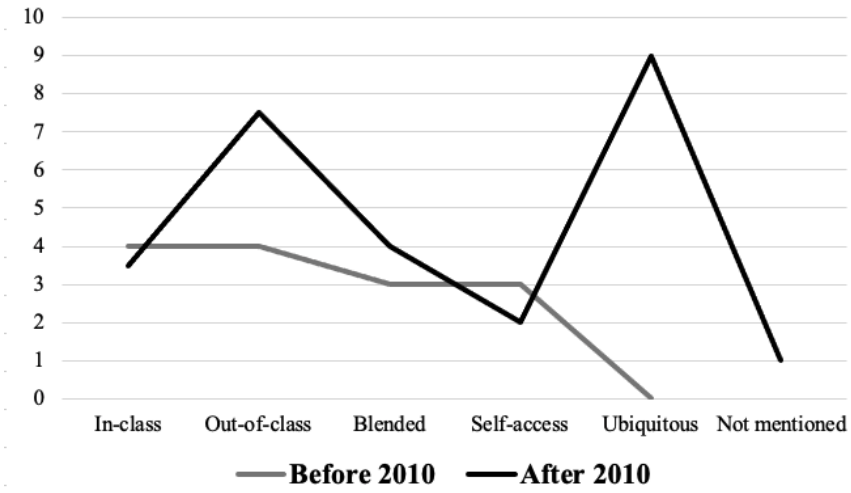


Regarding the location in which language learning occurs physically, the results (Figure 10) show that out of 41 studies, 28.04% of studies (*n*=11.5) were out-of-class studies as opposed to 18.29% of in-class studies *n*=7.5), 7 blended learning studies (17.07%), 5 self-access studies (12.1%), and 9 ubiquitous studies (21.9%). One study that compared in-class and out-of-class autonomy was not coded as blended but a 0.5 was awarded to both the sub-categories.

The trends analysis reveals that while there has been a slight dip in in-class (*n*=4 <2010 and *n*=3.5 >2010) and self-access studies post 2010 (*n*=3 <2010 and *n*=2 >2010), there has been a slight rise in blended studies (*n*=3 <2010 and *n*=4 >2010) and a more significant one in out-of-class (*n*=4 <2010 and *n*=7.5 >2010) studies. The most interesting finding of this analysis however, is the arrival of a new 'location' post-2010 (*n*=9), that is called *ubiquitous learning* (see ID27). Absent before 2010, the first documented study that looks at both autonomy and CALL of our dataset is published in 2012 (ID24).

Figure 10

Trends in Location



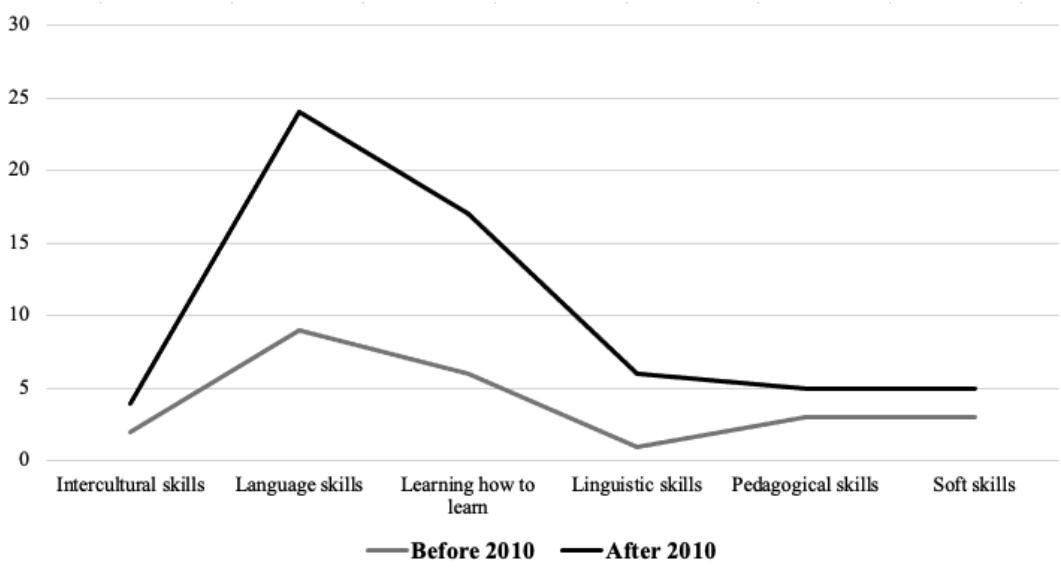
As mentioned in the methods section of this paper, the content analysis coding of the skills and competencies targeted by the studies were not mutually exclusive. Thus, one study (see ID7, ID11, etc.) could be coded multiple times if it called for targeting multiple skills and competencies at once. Since our search was based on Computer-Assisted Language Learning and teaching and learner autonomy, it seems

obvious that the two most targeted skills were language/communicative skills (listening, reading, writing, speaking, interaction) (*n*=24; 58.5%) and learning how to learn (*n*=17; 41.4%). Fewer studies targeted linguistic competencies such as vocabulary and grammar (*n*=6; 14.6%); soft skills, such as teamwork and collaboration (*n*=5; 12.1%), intercultural competence (*n*=4; 9.7%), and pedagogical or teaching skills (*n*=5; 12.1%).

As demonstrated in Figure 11, all the skills and competencies targeted by the studies have seen an increase in number post 2010, except for pedagogical and soft skills (for both *n*=3 <2010 vs. *n*=2 >2010). Moreover, there has been a significant increase in studies targeting language skills (*n*=9 <2010 vs. *n*=15 >2010). Only one study prior to 2010 targeted linguistic elements such as vocabulary and grammar (*n*=5 >2010).

Figure 11

Skills and Competencies Targeted in the Studies

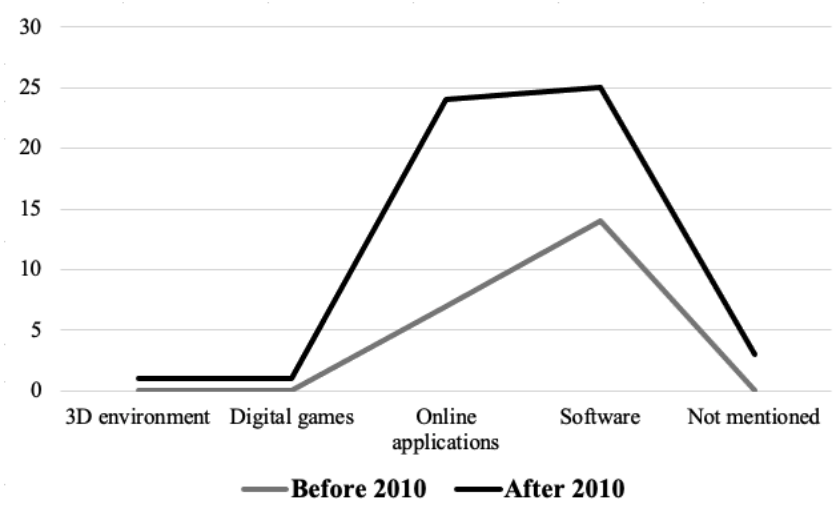


Finally, with respect to the CALL tools used by studies, software seems to be the most favored tool used with 24 studies (60.9%), followed closely by online applications (*n*=24; 58.5%). A few studies (*n*=3) make absolutely no note of the tools used, and one study each dealt with digital games and 3D environments.

The trends analysis (Figure 12) revealed one significant change that is probably due to the increasing number of technological tools at our disposal: a significant increase in the number of studies focusing on online applications post 2010 (*n*=17) as opposed to pre 2010 (*n*=7). Moreover, both the studies using 3D environments (ID17) and digital games (ID26) were published in 2011 and 2014 respectively.

Figure 12

Trend in the Type of CALL Tools used



Discussion

The aim of this paper was to methodically examine empirical studies that have investigated the trends and applications which lie at the intersection of CALL and learner autonomy, as well as to provide an overview of how researchers who publish in the top four journals of CALL (*LLT, ReCALL, System, CALL-J*) conduct research on aspects related to learner autonomy. At the outset of this study, we asked ourselves three questions pertaining to (a) the scope of interest, (b) features, and (c) the trends that emerge from a systematic study of empirical research at the intersection of learner autonomy and CALL. Content analysis allowed us to identify the categories which were then coded and quantified. The data extracted was then compared over two distinct periods, 1997 to 2010 and 2011 to 2020.

Fundamentally speaking, the results of this systematic review suggest that there has been an evolution in the type of research that is conducted over the course of 22 years. However, if the numbers tend to show an increase in the dataset after 2010, it is also because there have been more studies published in these journals post 2010 (n=26, vs. n=15 <2010). There are also a few salient results that beg interpretation.

The first one is the correlation between the types of research, the types of data, and the population size. As we have previously mentioned, the number of participants targeted for studies on learner autonomy and CALL has significantly increased after 2010. There has been a 26.8% growth in the studies that look at a population size of 51 and above. This trend explains the associated rise in the number of quantitative and mixed data (+12.1% each) that have been employed in studies since 2010. While case studies in empirical research on learner autonomy and CALL continue to be the norm, and wherein cognitive and metacognitive processes are explored via logbooks, questionnaires, and counselling sessions (see ID21), other forms of primary data sources can also be identified in the literature. These include complex types of data which allow for other aspects and dimensions of learner autonomy and CALL to be potentially explored. ID26 is one such example, wherein rich multimedia data such as gaming sessions, stimulated recall, focus group discussion, individual interviews, and online discussion forums have been collected so as to study the qualitative processes that emerge from digital game play.

The second correlation was identified between CALL tools, location, and the approaches to CALL. Results show that while multiple CALL tools can be simultaneously used to foster autonomy, and while the use of software (ID20) remains consistent over the years, there has been a significant increase (+24.3%) in the use of online applications since 2010. The advantages of using social media such as

"wikis" (ID10), "Facebook Twitter, Deezer" (ID24), and other downloadable applications such as "news apps, online e-books or downloaded ones, e-book or audio-book apps" (ID33) are that they can be used regardless of time and location, once they have been downloaded or provided that one has access to the Internet. The use of these applications can therefore, also be directly linked to the "ubiquitous" autonomous learning experience through either mobile-assisted language learning (ID33, ID41) or informal learning (ID24). This probably also explains why there is a significant rise (+34.4%) in the integrated approach to CALL.

The third and final correlation was identified between the learning contexts, degrees of formality, and location. A combined study of these three variables demonstrates that there is a definite shift in the manner in which the construct of learner autonomy is perceived with respect to CALL. The number of studies conducted in formal contexts seems to be decreasing marginally (-4.8%), in order to pave the way for contexts that are informal (+12.1%) and non-formal (+19.5%) in nature. A study of the physical location in which the studies have been situated shows that there has been a slight decrease in the use of in-class (-1.2%) and self-access centres (-2.4%), which tend to be more structured in nature. On the other hand, the use of blended (+2.4%) and out-of-class (+8.5) environments has increased. However, the most significant increase can be traced to ubiquitous learning environments (+21.9%) that indubitably contribute to normalizing the use of CALL. The trend is thus unmistakably moving towards an unstructured (+26.8%) degree of formality as opposed to structured or even semi-structured approaches (0% difference) wherein the locus of control lies with the teacher or the language advisor or somewhere within the folds of a task that is imposed on the learner.

With the varied learning contexts afforded by CALL tools, various combinations of the three variables, learning context (formal, non-informal), degree of formality (structure, unstructured), and location (in-class, self-access, ubiquitous), seem to emerge after 2010.

For example, ID2 is a quintessential example of a formal learning context, wherein learners are encouraged to use the available software in order to become technologically autonomous. The tasks at hand are presented to the learners with the underpinning hope that realizing the given tasks will make learners potentially autonomous. While ID16 might look at learners in a self-access language learning location and thus have an unstructured degree of formality, the learning context itself is non-formal, with findings that suggest that learners make use of self-access centres "to access tools and websites to help them complete homework, to communicate with friends (through Facebook and Skype, for example), and for watching online videos for entertainment" (p. 17). Both these examples suggest that the use of CALL tools have not, for these particular contexts of study, become as "normalized" (Bax, 2003) as one would expect them to be. On the other hand, both ID30 and ID33 adhere to an unstructured degree of formality in a ubiquitous environment of language learning but are set in two very different learning contexts. ID33 looks into informal mobile-assisted language learning, whereas ID30 is set in a virtual learning environment (Moodle) with the understanding that participants (teachers and students) will also call upon other CALL tools that go beyond the confines of the online classroom. Finally, it should be noted that these results highlight the permeating nature of the three learning contexts while calling future studies to better define that which lies at the intersection of formal, non-formal, and informal learning contexts.

Conclusion

This systematic review examined the "symbiotic" relationship (Reinders & Hubbard, 2013, p. 359) between learner autonomy and CALL in the light of 41 empirical studies published in four selected journals, *LLT, CALL-J, System and ReCALL* from 1997 to 2020. The three variables identified, research methods, population data, and the pedagogical settings selected for this study have yielded some interesting results that may have served to unravel some of the mechanisms that go into building the autonomy-CALL relationship. There are, however, certain challenges that we have not been able to overcome. For instance, we had hoped to explore the link between the CALL tools used by the researchers of our dataset and the language proficiency level of the participants. However, it was difficult

to pin-point standardized proficiency levels of learners across the culturally diverse educational locations that were at our disposal and therefore we were unable to form linkages. What we could observe however, is that a majority of empirical studies are conducted with undergraduate students, who possess different levels of proficiency. Thus, while we may not be in a position to identify with certainty the types of CALL tools a beginner or an intermediate learner may solicit, we can advocate that CALL tools are suitable for differentiated, personalized learning.

The idea that permeates from reading the literature on learner autonomy is that autonomy, a notion often used as an umbrella term in language teaching and learning, is to be developed in an institutional setting such as a self-access centre, and that a learner must appear at the study desk with specific objectives and a clear agenda in mind if they are to learn a language autonomously. The results of the present systematic review have forced us to question this idea, as the 41 empirical studies selected for this systematic review perceive and explore autonomy in very different ways. It has also allowed us to observe the multifarious research methods employed by researchers studying language and learner autonomy in CALL settings. For instance, we learnt of the great diversity of pedagogical settings that are set up by researchers to promote learner autonomy, in which self-access centres are not in the majority. New "locations" (to use Benson's, 2011b term), which are paradoxically not steeped in a single "physical" setting, seem to be emerging (Murray, 2014; Murray & Lamb, 2017). That is, institutional learning seems to be paving the way for semi-structured and unstructured settings. These results resonate with the results obtained in Sockett and Toffoli's (2012) study that attests that everyday practices such as participation in virtual communities, online video viewing habits, and on-demand music listening strategies have an impact on language learning. We do not, however, necessarily agree with the conclusion of these authors when they "question(s) the relevance of the learner autonomy paradigm, which has been a cornerstone of language learning policy in Europe for the past thirty years" (p. 138).

The present study reveals that the "learner autonomy paradigm" continues to be as relevant, if not more, than it was thirty years ago, as researchers continue to situate their studies in this paradigm. It suggests however, that with coming-of-age technological advancements, we are in the presence of two distinct perspectives to approaching language learner autonomy. On the one hand, we have Holec (1981) and Little's (1991) noteworthy theoretical contributions, which address epistemological democratization of cognitive learning resources. In this perspective, language learning resources are *made available* to learner with the locus of control shifting from the teacher/advisor to the learner. The more the learner develops *language* autonomy (learns the language autonomously), the more they may develop *learner* autonomy (how to become autonomous). On the other hand, with the opening up of the Internet and the onset of Web 2.0 (see Cappellini et al., 2017), a learner may call upon and unintentionally develop language autonomy from the easy availability of resources at their disposal. The language advisor is clearly absent from this equation, and it is up to the learner to salvage their learning either from the interdependence that is brought about through social interactions (Kalyaniwala, 2018) or simply from "learning in the wild" (Sauro & Zourou, 2019).

While these two viewpoints seem to be at loggerheads with each other, we cannot help but wonder whether instead of being two singular paradigms, they do not simply complement each other. Are we in a phase in which the concept of learner autonomy is being restructured to learn from informal learning spaces and settings that normalize CALL? Or is CALL being adapted and schemes of utilization (re)discovered to respond to the growing needs of an autonomous language learner? Further research dealing with these questions is needed. The processes that underline the making of an autonomous language learner, equipped (or not) with technology, need to be further explored. While empirical research continues to reflect the reality on the ground, systematic studies that analyze additional aspects of the relationship between learner autonomy and CALL by delving into other published sources need to be considered. How do researchers working with learner autonomy and CALL view and conceive the concept of autonomy? What do the results of these studies demonstrate with respect to the variety of research questions at hand? Meta-analyses that delve into quantitative studies and identify variables that help in measuring the development of autonomous skills could also be endeavored.

Acknowledgements

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Notes

1. The first self-access language learning centres were set up at CRAPEL, France and the University of Cambridge, England, providing opportunity for experimentation with self-directed learning (Benson, 2011).

2. As Lee (2019) points out, "The terms extramural English (Sundqvist, 2009), online informal learning of English (Sockett, 2014), out-of-class English learning (Lai et al., 2015), and language learning and teaching beyond the classroom (Reinders & Benson, 2017) may seem different, but […] these notions share much in common when regarding their perspectives and principles" (p. 123).

3. For examples of a purposive searching approach, refer to Brunton et al. (2017).

4. By "empirical", we refer to research wherein the results have been derived by means of direct and indirect observation or experience.

5. Although these types of studies do indeed contribute to shaping the research field, data utilized for the elaboration of such studies cannot be compared rigorously and objectively.

6. Studies such as ID6, wherein the development of "independent learning skills" is explicitly linked to the development of autonomy and CALL have been retained.

7. This criterion applied solely to the journal *System* since the journal doesn't specialize in CALL research as opposed to LLT, ReCALL and CALL-J.

8. The spreadsheet will be made available on the IRIS database.

9. 2010 is the year that splits the dataset into two halves and allows for a better understanding of the trends over time.

10. Details such as "third-year university-level learners of Spanish" (ID17) do not unfortunately reveal much as to the language proficiency of learners.

11. Our initial choice of the four journals, which only publish in English, influences this finding. Researchers working on French, Spanish, German or other languages publish their work in other journals using those languages. Another systematic review (Kalyaniwala & Molle, in press) on research on learner autonomy published solely in French bring to light other results.

12. https://www.busuu.com/en/about.

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Appendix. Included Studies

Included studies in the systematic review have been referenced in the order of the year of publication.

ID	References
1	Murray, G. L. (1999). Autonomy and language learning in a simulated environment. *System*, *27*(3), 295–308. https://doi.org/10.1016/S0346-251X(99)00026-3
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