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Using more native-like language acquisition processes in the foreign language classroom

Kieran Green[1]*

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*Corresponding author: Kieran Green, Osaka Dental University, Hirakata, Osaka Prefecture, Japan.
E-mail: kieran_green@hotmail.com

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Additional information is available at the end of the article

Abstract: This work presents the case for using native-like language and learning networks in the classroom-based teaching of foreign languages and suggests how this might be done for EFL lessons. Networks in both syntax and syntax learning are discussed. Language and learning networks are then identified using principles from Evolutionary Linguistics and Cognitive Linguistics. The work culminates in an examination of how the identified networks in language and language learning can be better employed by teachers in the classroom to improve retention and use. Three general lesson plan types are suggested, which correspond with the three language network types that have been identified, which go further to attach meaning to the structures learnt in class.

Subjects: Bilingualism & Multilingualism; Linguistic Theory; Cognitive Linguistics; Language Teaching & Learning

Keywords: cognitive linguistics; evolutionary linguistics; networks; foreign language teaching; language usability; language learnability; EFL; language acquisition

1. Introduction

All humans use language in the same way (Calude & Pagel, 2011; Fitch, 2011; Kemp & Regier, 2012): language is what humans do. Furthermore, humans did not *invent* language; rather, it arose over time (Hauser et al., 2014; Szathmáry & Smith, 1995). However, despite humans having used language for a long time, we still have much to understand about how we develop competency in the use of a language, how language is stored in the brain, how it is processed and produced in communication, and why language change over time benefits these. Moreover, we are still unable to facilitate development of proficiencies in the foreign language classroom that are close to those native children are able to develop in a very short time, and although a great deal of progress has been made in the last couple of decades or so to meet unknowns, much of the work in the aforementioned fields has not found its way into the foreign language classroom in the form of teaching practise. While it is clear that competency with a language comes about through use (Ellis, O'Donnell, & Römer, 2015; Tomasello, 2008), problems with content-based, task-based and other student-centred methodologies abound (Baecher, Farnsworth, & Ediger, 2014; Bruton, 2011; Ellis,

ABOUT THE AUTHORS

My research activities take place at the intersection of human evolution, cognition and memory, and language learning and seek to bridge the gap in proficiencies in learning one's native language and foreign languages, focusing on compulsory foreign language lessons in secondary and tertiary education.

PUBLIC INTEREST STATEMENT

The broader implications of this work are diverse and far reaching. On one hand, the work presented here explains why it has been difficult for past generations to use the foreign languages they learnt at school, and how we can change this for future generations. However, the work presented here also gives a good example of how teaching practices need to fit how the brain has evolved to learn in order to maximise the benefits conferred upon students in a formal learning environment.

2009; Foster, 2009), often because teachers do not understand what they ought to do, because linguistic objectives are hard to incorporate, or simply because lower proficiency levels do not have the language skills to participate.

Grammar is essential to language use: a gifted person could memorise the dictionary of a certain language, but would not be able to communicate using that language without knowledge of grammar. This paper is the result of research aiming to identify how native-like syntax-learning processes can be better replicated and incorporated into lessons. Initially these lessons are designed for university students on compulsory courses, with lower levels of proficiency, who have already been the recipients of many years of formal, classroom-based, English as a Foreign Language (EFL) tuition, but who have never developed any communicative competence although the method could equally well be used with children starting their foreign language education. The need for the work has arisen because it is clear that under current teaching practises some aspects of a foreign language are very hard to retain and use for students, such as past participles in English, but they are integral to using that specific language.

One good candidate reason for the general underperformance of classroom-based foreign language acquisition is not utilising the network structure of language as an integral part of the learning process when building form-meaning units. Native-speaking foreign language teachers, i.e. those teaching abroad, are all familiar with students who are able to complete paper-based exercises, e.g. gap-fill exercises, perfectly, but who have no skill at all in using the structures in the exercise to communicate. The work presented here suggests ways to incorporate network-based methods to better build form-meaning pairings in the classroom, and is useful for foreign language teachers as it suggests lessons plans for the purpose.

The work begins by examining networks in words and structures and in language learning, goes on to identify those language networks that ought to be taught in EFL lessons and culminates with corresponding lesson plans.

2. Networks that contribute to language acquisition

Networks, like fishing nets laid out on a beach, can be two-dimensional, or if each point of connection, or *node*, connects to many other points of connection, can be in more dimensions. More complex systems can have links—or *edges*—of different strengths, exist only between specific nodes, have multiple levels or be active only at certain times (Davies, Kounios, & Power, 2015; Kivelä et al., 2014; Sayama, 2015). Networked systems pervade nature, including brain structure and function, and language.

2.1. Networks in the brain: Domain-general behaviour, learning and "chunks"

The brain is a network of activity, with neurones being linked to other neurones and electrical activity travelling across them (Medaglia, Lynall, & Bassett, 2015; Mišić & Sporns, 2015; van Schijndel, Exley, & Schuler, 2013; Yaveroğlu et al., 2014). Furthermore, domain-general behaviours, being controlled by the brain, also exhibit network properties, as do learning behaviours (Hinton, 2007; Solway et al., 2014). Examples of networked learning-behaviours providing added benefits for learning include reduced processing times with increased intelligence (Hearne, Mattingley, & Cocchi, 2016; Tang et al., 2010), predictive ability (Clark, 2013; Weber, Lau, Stillerman, & Kuperberg, 2016), finding patterns (Egner, 2014; Tenenbaum, Kemp, Griffiths, & Goodman, 2011), learning by trial and error (Botvinick, 2012; O'Doherty, Lee, & McNamee, 2015), and adaptive behaviour (Cushman & Morris, 2015; Schiffer, Waszak, & Yeung, 2015).

It is important to note that these domain-general networks of activity and learning are also present in the brains of other animals (e.g. Bardella, Bifone, Gabrielli, Gozzi, & Squartini, 2016; Dehghani et al., 2016). Furthermore, learning actually changes brain networks (Bassett et al., 2011; Bola & Borchardt, 2016), meaning the brain can be seen as a network that is in constant flux. Indeed, if the

physical structure of the brain is in flux, then so too must any stored information. Taking small combinations of stored information from cognitive networks and using them sequentially, whether in learning, processing or production, is called *chunking*, the small combinations being *chunks*. Chunking is a defining characteristic of how the brain learns and manages information and is thought to be instrumental in allowing integration of the short-term memory and long-term information retention and learning (Chekaf, Cowan, & Mathy, 2016; Fonollosa, Neftci, & Rabinovich, 2015; Lee, Seo, & Jung, 2012; Mathy, Fartoukh, Gauvrit, & Guida, 2016), and networks in language production and processing most probably rely on chunking. Having now looked at domain-general learning networks, the network-like structure of language will be examined.

2.2. Networks in language

Language structure is determined by brain function (Bickel, Witzlack-Makarevich, Choudhary, Schlesewsky, & Bornkessel-Schlesewsky, 2015; Garagnani & Pulvermüller, 2016; Skeide, Brauer, & Friederici, 2015; Zaccarella & Friederici, 2016), and is composed from combinatorial signals—chunks—from networks of stored inventories (Carr, Smith, Cornish, & Kirby, 2016; Christiansen & Chater, 2016; Hoffmann & Trousdale, 2011; Martinčić-Ipšić, Margan, & Meštrović, 2016; Solé, Corominas-Murtra, Valverdie, & Steels, 2011). Furthermore, the signals from which language is composed are ambiguous in their meaning unless placed in context (Piantadosi, Tily, & Gibson, 2012; Wedel, 2012), and that context, and the meaning created, are derived from learning (van Dijk, 2006; Krishnan, Watkins, & Bishop, 2016; MacDonald, 2015; Tamariz, Ellison, Barr, & Fay, 2014; Ullman, 2016). For native speakers learning in their natural environment, learning depends on the frequency of exposure to a certain linguistic structure, or form, and its situational concomitant meaning. This meaning is initially generalised and ever more refined and segmented as the frequency of contextually experiencing the form-meaning pairing increases (Frost & Monaghan, 2016; Silvey, Kirby, & Smith, 2015).

Therefore, bringing meaning to ambiguity through context results in a finite set of signals becoming a rich and flexible system of language that is able to convey infinite meaning. Nodes of ambiguous words in the environment are linked to nodes of ambiguous cognitive concepts and given meaning after being linked to other nodes by edges of context. Moreover, the process of composing signals from these networked components manifests the syntactic structures found in language.

For example, in English, embedded structures (Christiansen & MacDonald, 2009; Miyagawa, Berwick, & Okanoya, 2013), dependency of time, gender and number/countability—or parsing (Beuls & Steels, 2013; de Vries, Magnus Petersson, Geukes, Zwitserlood, & Christiansen, 2012; van den Bos, Christiansen, & Misyak, 2012) and collocations and linguistic formulas (Brezina, McEnery, & Wattam, 2015; McCauley & Christiansen, 2014) are all examples of networks that are ambiguous nodes of words and meanings until linked together by edges of context to create word-meaning associations. In this work, a specific type of collocation or formula will be concentrated on, namely a root word that appears with other words on separate occasions that change the context and therefore the meaning, e.g. past participles being found with different auxiliary verbs. Specific examples are presented below in Table 1.

Finally, networks in communication signals are not unique to humans (Collier, Bickel, van Schaik, Manser, & Townsend, 2014, Rey, Perruchet & Fagot, 2012), and as described above with domain-general learning being networked, gaining the ability to use a language—language acquisition—is the interaction of language networks, and learning and memory networks, which will be examined below.

2.3. Networks in the acquisition of syntactic structures and their concomitant meanings

Memory and learning are networked phenomena with different areas of the brain being linked together and playing different roles. Working memory, colloquially called short-term memory, is very limited and can store correctly three to five "chunks" of information (Baddeley, 2012; Cowan, 2010),

and it is necessary to minimise any dependency on working memory when learning to use languages (O'Grady, 2015). Long-term memory, which is associated with learning, is understood as being of the following two non-exclusive types: procedural memory—implicitly learning through practice, such as learning a sport, playing an instrument or using tools—and declarative memory—explicitly memorising things like dates and names for an exam (Andringa & Rebuschat, 2015; Ellis, 2015; Morgan-Short, Faretta-Stutenberg, Brill-Schuetz, Carpenter, & Wong, 2014; Ullman, 2016).

Specific implicit learning phenomena that relate to the frequency of occurrence of certain structures, or formulas (e.g. Ellis, 2012; Wray, 2012, 2013), resulting in those formulas becoming entrenched and proceduralised (Krishnan et al., 2016; Ullman, 2016), and gramaticalised (Chang, 2008) include a bias towards using recently heard structures—a process called structural or syntactic priming (Kaschak, Kutta, & Coyle, 2012; Mahowald, James, Futrell, & Gibson, 2016; Pickering & Ferreira, 2008; Rowland, Chang, Ambridge, Pine, & Lieven, 2012), entrenching forms after repetitive exposure—a process called statistical learning (Fine & Jaeger, 2013; Frank, Tenenbaum, & Gibson, 2013; Vuong, Meyer, & Christiansen, 2016), demarcation of word boundaries (Erickson & Thiessen, 2016; Finn & Hudson Kam, 2015) and allocation of syntactic category (Reeder, Newport, & Aslin, 2012; Robenalt & Goldberg, 2015). Other specific examples of implicit learning include mastering embedded hierarchies (Lai & Poletiek, 2011, 2013) and embedded relative clauses (Fitz, Chang, & Christiansen, 2011), and eliminating ambiguity by learning to parse (Haskell, Thornton, & MacDonald, 2010; Phillips & Ehrenhofer, 2015; Pozzan & Trueswell, 2015). Specific examples of syntactic structures are presented in Table 2.

Additionally, specific learning phenomena of which the language user has some awareness—explicit learning—include building meaning through comparison and attaching it to words (Lany & Saffran, 2011; Wojcik & Saffran, 2013) and structures (Syrett, Arunachalam, & Waxman, 2014; van Dam & Desai, 2016), and using generalised concepts of meaning in different contexts (Finn & Hudson Kam, 2015; Fisher, Gertner, Scott, & Yuan, 2010; Foraker, Regier, Khetarpal, Perfors, & Tenenbaum, 2009). Specific examples of syntactic structures are presented in Table 2 below.

Notice that the second and third rows and the last row in Table 2 are very similar to the three rows in Table 1.

To enable foreign language teachers to use language networks effectively in the classroom, it is necessary to know which form-meaning parings to teach foreign language students and how they are created by native speakers.

Table 1. Examples of syntactic structures in English that employ network-like structure

Type of structure	Examples
Embedded structures standalone structures can be placed inside other structures	• "be going + infinitive" for future plans, e.g. I'm going to the supermarket to buy some onions • Relative clauses, e.g. Yesterday I saw a film that was about monkeys
Dependencies words immediately after or further along in the sentence are dependent on prior words for their form and meaning	• Third person singular, e.g. he runs/they run • Plurals, e.g. 1 cat/2 cats • Time agreement, e.g. Yesterday I saw a film. It was about monkeys./Now we're watching a film that's (is) about snakes." • Time words and verb aspects, e.g. present simple-everyday/always; present simple continuous-now/at the moment
Transposed concepts of meaning a root word is found with other words at different times that changes the context and therefore the meaning	• Past participle + "have been" for passive/"be" for adjective/"have" for perfect • Verb + preposition formulas, e.g. look at/look for/look round • Phrasal verbs, e.g. put it on/put it up/put it out

Table 2. Networked syntactic structures that are learnt with networked-learning

Learning processes that are more implicit		
Type of networked-learning process		*Examples of networked structures*
Statistical learning from repetitive processing	Using a recently heard syntactic structure—priming	"**I've already** put my jacket on. Have you done it yet, sweetheart?""Yes. **I've already** done it daddy
	Entrenching of syntactic form	"Where it gone daddy?""Where**'s** it gone, pal? Say it.""Where's it gone?"
	Demarcation of word boundaries	Where's the ball gone?(the speaker marks the beginning of ball with "the" and the end of ball with the previously known word gone)
	allocation of syntactic category	"Where's the foogy gone?""What's **a** 'foogy'?" (the listener knows it is a noun)
Embedding combinations of regularly heard forms		"I'm going to the park.""What are you going to do in the park?""I'm going to the park to play football.""The man with the beard.""Who? Which man?""The man with the beard who was talking to me before"
Dependency of time, gender and number/ countability—or parsing—eliminating ambiguity		"The teacher speak funny English daddy.""I know pal. It's a travesty. How many English teachers are there?""One."The teacher speak**s** funny English"
Learning processes that are more explicit		
Building meaning by comparing and attaching it to structure		"Have you eaten your breakfast yet?""Yes, I have.""What time did you eat it?""At 6,30am."The girl**'s** (has) gone, but the boys **have**n't yet"
Building meaning by comparing and attaching it to words		Breakfast (morning), lunch (afternoon), dinner (evening)time words and verb aspects, e.g.I've **already** done it.I did it five minutes **ago**. She's **already** gone, but they haven't **yet**
Generalising and transposing concepts of meaning between different contexts		Past participles being used in different situation (perfect, passive or adjective) to infer that something has happened before the time of speakingVerb and preposition combinations

3. Identifying which form-meaning pairings to teach in the foreign language classroom and how they are created by natives

Having defined the roles of networks in language structure and acquisition, it is now necessary to know which structures are the most important to teach in a foreign language classroom, and how those forms are given meaning by users through experience. In this case, the "most important networks" being those that facilitate any rudimentary-level of communication. In order to do this, two different branches of linguistics will be employed: Evolutionary Linguistics (EL) and Cognitive Linguistics (CL). Both will be explained in greater detail below, but a comparison is presented below in Table 4. Essentially, EL is a way of understanding words and structures and CL is a way of understanding how meaning is attached to words.

Learning the meaning of language through use is a common phenomenon observed in action by all parents and all persons who go to live in a country where a different language is spoken. However, while CL can explain how meaning is attached to language, it cannot tell us to why it becomes attached to the language units it does, which is where EL is needed. To identify and use networks in language in the foreign language classroom, we need to employ ideas from EL and CL, and a comparison of both is presented in Table 3.

Evolutionary Linguistics is a framework of theories that model some reasons as to why words and structures change in terms of becoming easier to learn and use after being inherited from parental generations in the process of iterative learning, or learning by copying (de Boer, 2015; Kirby, Griffiths, & Smith, 2014). As they have social impacts, the processes that drive language change in EL are referred to as cultural selection (Steels, 2011; Tamariz et al., 2014). The implications for words and structures are broad, and EL has been used to explain semantic change (Landsbergen, Lachlan, Ten Cate, & Verhagen, 2010), syntactic change (Kirby, Tamariz, Cornish, & Smith, 2015) and vocabulary evolution (Smith, 2004).

Table 3. Comparing evolutionary linguistics and cognitive linguistics

	Evolutionary linguistics	Cognitive linguistics
Summary of research aims	Why do **words and structures** in language change and what changes?	How does the brain store, process and produce **meaning**?
Founding tenets	Language changes to be more usable and learnable	No existence of an innate language function
		Knowledge of language exists in the brain as a concept
		Knowledge about language comes through use
Processes	Iterated learning	Building meaning through
	Cultural selection	repeated situational use
What does the field explain?	Semantic change	How meaning is
	Syntactic change	communicated using
	Vocabulary evolution	language and how this skill is acquired
Use in employing networks in the classroom	Identifying *what* language should be taught	Determining *how* to create concepts that create form-meaning pairings

Cognitive Linguistics (CL) is a branch of linguistic research that uses principles that are general to cognition as a whole to model some ways the brain learns and uses language from the environment. First, that an innate linguistic faculty does not exist, i.e. all brain-based competencies used for the production and processing of language are not language-specific; second, that the meaning of language exists in the brain as concepts; and finally, that meaning comes through use (Croft & Cruse, 2004, Pleyer & Winters, 2015). Core ideas in CL are the Cognitive Commitment and the Generalisation Commitment. Essentially, the Cognitive Commitment states that any ideas about how the brain handles language should not be different to how the brain handles any other task; whereas the Generalisation Commitment states that any principle in CL should apply to all human languages (Evans, 2012). Meaning coming through use, is referred to as the "usage-based" approach (Ellis et al., 2015; Janda, 2015; Tyler & Ortega, 2016), and two subthemes from CL, Connectionism and Constructivism, approach the topic in different ways (Lain, 2016). Connectionism sees knowledge as being represented as patterns of numerical activity across simple processing units; where processing occurs across large sets of connections in networks, and; in which learning occurs through non-language specific, general mechanisms combined with experience (Joanisse & McClelland, 2015). Constructivism sees individuals creating meaning over time through experience and active participation, rather than "acquiring it", and that this knowledge occurs within the context that was learnt (Ertmer & Newby, 2013). Both these ideas rely on the network structures of concepts and situational use (Baronchelli, Ferrer-i-Cancho, Pastor-Satorras, Chater, & Christiansen, 2013).

3.1. Combining EL and CL

Language exits as words and structures that human brains can attach meaning to and use to communicate effectively. Networks of cognitive form-meaning parings allow efficient communication—storage, retrieval, processing and production—in real time (Chater, McCauley, & Christiansen, 2016; Garagnani & Pulvermüller, 2016), making language usable and learnable.

Language is usable because the different network types present in language—reusing the same word in different combinations/chunks/transposing concepts (Arnon & Christiansen, 2014, Christiansen & Chater, 2016), dependencies (Dyson, 2009; Hoffmann & Trousdale, 2011; Kuperberg & Jaeger, 2015; O'Grady, 2015; Omaki & Lidz, 2015; Traugott, 2014) and embedded structures (Lai & Poletiek, 2011; Piantadosi et al., 2012; Trueswell & Gleitman, 2007)—have evolved to be dealt with by a brain that operates using different memory types that have finite capacities for storage and processing (Krishnan et al., 2016; Vagharchakian, Dehaene-Lambertz, Pallier, & Dehaene, 2012) and uses proceduralisation and prediction to speed up processing (Huettig, 2015; van Schijndel et al., 2013).

Table 4. Language change examples, their evolutionary drivers and situations in which natives might become familiar with them

	Language change status			
	Changed		**Changing (used often but not accepted as standard)**	**Has not changed despite expectations**
	Lost (not used anymore but still exists)	**Has found multiple uses**		
Example language	Whom	Past participle (perfect, passive, adjective)	Have got to do (obligation)	Third person "s", apostrophe "s" and plural "s"
Usability or learnability advantage as a consequence of change	Other forms, which are more easily recalled, are now more common	Transposing the concept reduces the amount of information that it is necessary to store and/or process and makes learning easier	Recursive-like structures reduce the amount of information that it is necessary to store and/or process and makes learning easier	These concepts are part of bigger networks that are integral to how the language functions, e.g. English does not work without plural/countable and singular/uncountable nouns or determiners
Example of an iterated learning situation	A child who has given his toy to someone: "Who did you give it to?" NOT "To whom did you give it?"	To a child when she's finished her breakfast: "Done?"	To a child who is hanging on his dad's leg: "I've got to go. Let go please."	"Where mummy?""Where**'s** mummy? Your mum**'s** already gone out"

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Language is learnable because the combined characteristics of language and cognition mean an individual is able to learn his or her native language by interacting with the environment (Lain, 2016; Tamariz et al., 2014; Winters, Kirby, & Smith, 2015), and that other users of the same language distributed in time, e.g. generations, space, e.g. continents, can still understand each other (Silvey et al., 2015, Wedel, 2012) despite their different learning experiences (Foraker et al., 2009; Kirby et al., 2015).

3.2. Identifying specific examples of networked structures

Identification of the most important networked words and structures that are learnt in a natural, native environment that need to be taught in the foreign language classroom can be effected by employing ideas from EL. If language is changing to be more usable and learnable, it is necessary to teach the language that is changing as a part of the networks in which it is changing. To facilitate this analysis, the level of change has been categorised as follows: lost, has found multiple uses, currently changing and has not changed despite expectations. These categories and examples, are then cross-referenced with their proposed drivers of evolutionary change and contextual situations in which a native might become familiar with them are presented in Table 4. The forth column in Table 4, which depicts structures that have not changed despite an expectation that they might is not trivial. Networks of overlapping usages, some of which are vital to the functional integrity of the language, might conserve certain domains of linguistic structure through a language's evolutionary history, as with specific areas of restricted genome change in biological evolution (Blair Hedges & Kumar, 2003; Siepel et al., 2005). Furthermore, the third row, which presents examples of iterative learning situations, helps users to build a meaning and attach it to a structure: a process that leads on to the next section, which seeks to identify how specific concepts of meaning are formed.

Additionally, identification of the most fundamental networked concepts of meaning that natives attach to certain words and structures that need to be taught in the foreign language classroom can be effected using ideas from CL. The words and structures presented in Table 4 are processed in situations providing context, and meaning is formed over repeated episodes of use. Examples of how these concepts are linked with the concomitant language in the natural environment, which might be replicated in the classroom, are presented in Table 5 along with the three previously identified network types: embedded structures, agreement and transposed concepts of meaning from Tables 1 and 2.

Having now identified the most fundamental form-meaning pairings in English that ought to be taught in the EFL classroom, it is possible to construct lesson plans that replicate these learning processes in lessons.

4. Replicating how natives use cognitive and linguistic networks to create and proceduralise form-meaning pairings in the EFL classroom

Having identified how networks are involved in language and language learning, presented below in Table 6 are three lesson plan types, based on the three learning networks identified, namely embedding, dependencies and transposing concepts of meaning.

The same language and learning networks have been followed in Tables 1, 2 and 5. However, implicitly learning from repeated expose to certain structures and explicitly attaching concepts of meaning to words and structures appear only in Table 2. That is because these learning processes need to be a part of every lesson. Furthermore, although these lesson plans aim to facilitate implicit learning as much as possible, it has been shown that in the early stages of learning a foreign language, implicit learning alone is not effective (Andringa & Rebuschat, 2015; Boers, Lindstromberg & Eyckmans, 2014), and some explicit instruction and declarative-learning is beneficial (Morgan-Short et al., 2014). These lessons should therefore contain a minimum of explicit instruction, but the lessons must be repeated continually to facilitate implicit learning. Additionally, each lesson must contain an element that demonstrates that student has linked a concept of meaning to the language being used.

Table 5. Examples of networked syntactic structures and social situations of use in which they could gain meaning

Network type	Example sentence (and syntactic structure)	Example of a social situation in which the language gains meaning	Examples of this kind of networked syntax
Embedding	I'm going to the department store to buy a new hat. Be going to (continuous "go" for a future plan)	Asking someone who is just about to go somewhere: "Where are you going?" Then, "what are you going to do there?"	Recursive descriptions; relative clauses
Agreement of dependencies	The boys buy cakes from the girl. OR The boy buys cakes from the girls. (third person, plural and possessive "s"; from or for)	Parsing to learn: finding greater expressive competence if "s" endings are used correctly-What are you doing?Do you always do that?	How much and how manycomparisons of simple and perfect aspects of past, present and future tenses
	I go to work every day. OR I'm going to work now. (work every day OR working now)		
Transposing concepts of meaning to different contexts	Look at the black board!Look "at" NOT look "up" (verb and preposition combination) Put your jacket on! (separable phrasal verb and "it")It's already been eaten.Eaten (past participle and different auxiliary verbs)	"Look!" The child looks up, but what should he be looking at? "Look at the board!" "Put on your new, warm, winter jacket! Put it on!"using the past participle without auxiliary verbs then using auxiliary verbs as proficiency improves	Verbs as either gerund or infinitive after the head verb; order of adjectives; longer comparatives' present participles as gerunds, continuous verbs and adjectives; multiple uses of get and usephrasal verbs and verb and preposition combinations

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Table 6. Lesson plan types that incorporate linguistic and cognitive networks to build meaning through use and attaching it to structures and words

Lesson plan type	Examples of syntactic forms that might be taught using this approach
Embedding	This method could be used to endow students with skill in the use of embedded structures, such as "be going to + [verb]" future, and relative clauses. Lessons would begin with familiarising students with a zero level structure in the first few weeks, and slowly introducing the embedded portion. Pictures and pair work would be used to build meaning
Agreement of dependencies and comparing dependencies	Here *parsing-drills* could be used to first indicate to students that they need to listen for, for example, third-person, present-simple "s", and then to use pictures and pair work to demonstrate the difference between, for example, "the boys give presents to the girl" and "the boy gives presents to the girls" and to create meaningTo build meaning for, for example, the difference between simple past "I did it yesterday" and present perfect "I've already done it", first a concept of the difference between "yesterday" and "already" needs to be formed
Transposing concepts of meaning to different contexts	Meanings for words that have multiple meanings that are demarked by their context can be done by first creating a concept for the base-form, and then introducing the different situations in which the base form-meaning pair is modified

Table 7. Examples of syntactic forms that might be taught using these different teaching approaches

Teaching approach	Examples of syntactic forms that might be taught using this approach
Embedding	Be going to, relative clauses; "if" conditionals; relative pronouns as question words and in relative clauses
Agreement of dependencies and comparing dependencies	How much and how many; plural "s"; third person "s"; apostrophe "s" for possession; verbs as either gerund or infinitive after the head verb; order of adjectives; longer comparatives being "more + adjective"; time words and verb moods
Transposing concepts of meaning to different contexts	Past participles as perfects, passives and adjectives; present participles as gerunds, continuous verbs and adjectives; get (obtain, posses, obligation, passive, catch transport, phrasal verb, arrive); used to be, what use is it, what's it used for?, used to doing

These methods could be used to teach most of the structures used in everyday English, as depicted in Table 7.

5. Conclusion

Lesson plans have been suggested that purport to facilitate learning in a more native-like way in classroom-based EFL lessons, and thereby aid retention, recall and communication skill. The proposed lesson plans use the results of linguistic, teaching and neuroscience research to provide a bridge across the gap between compulsory foreign language students and children learning their native language in order to improve foreign language teaching.

Core to the argument presented is the use of the same three networks used in learning and the use that are present in English, namely embedded structures, agreement of dependencies and transposing concepts or meaning. It has been shown that the brain stores, retrieves, processes and produces information as networks of ambiguous concepts that gain meaning through context, and the lesson plans presented here use the same networks as those found in the networks in words and structures, and learning.

The teaching approach suggested might be termed *guided-implicit learning*, and it aims to intensify and speed up natural implicit learning processes such that the benefit provided by the necessarily limited amount of classroom instruction time is maximised. Furthermore, three general lesson plan types have been defined, which are based on the networks shown to be present in English and accessible by networked, domain-general learning processes in human cognition. .

6. Future research

Despite the advances made in teaching a foreign language that are made by incorporating the network principles discussed above, further resolution is necessary of the syntactic structures and the roles of language and learning networks determining how native speakers learn and use them.

Examples might include how native speakers implicitly know to use a gerund ("-ing" form) or an infinitive ("to" form) of a verb when it is used as the subject of another verb, for example, "I want to do" or "I suggest doing". Another might be implicitly knowing the required order of adjectives, for example, "the fat, tired, old, grey, EFL teacher" and not any other combination. Certainly, *data driven learning* (Boulton & Tyne, 2013; Callies & Paquot, 2015; Gablasova, Brezina, & McEnery, 2017; Granger, 2008)—using software to analyse collections of language use grouped by type, for example, native-speaking children of different ages, which is available for example, in the CHILDES database in the Talkbank system—will be indispensable in identifying learning and using networks in any future work.

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Author details
Kieran Green[1]
E-mail: kieran_green@hotmail.com
[1] Osaka Dental University, Hirakata, Osaka Prefecture, Japan.

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