

Reflections on language-learning in the 21st century: The rhizome at work

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Submitted 18 March 2011; accepted in final form 27 April 2011

Abstract

This reflective, future-oriented paper identifies eight trends/directions relevant to (language-) learning in the early part of the 21st century: an unprecedented rate of change; an unprecedented richness of information; a growing emphasis on interdisciplinarity; the potential growth of a research mentality; the centrality of meaning-making in all learning; the power of social networking; the need for creativity and divergent thinking; the empowerment of the learner. It then proposes a model of teaching/learning based on the notion of the rhizome as a way responding better to students' needs through the elicitation of individual needs, and coupled this with a technologically-based solution constructed on a multimedia database.

Keywords: *culture learning, language learning, methodology, computer assisted learning, rhizomes, critical pedagogy*

Introduction

The first decade or so of the 21st century has seen enormous changes on the geopolitical scene: the Tunisian government has fallen, the Egyptian government has fallen, Libya is on the verge of civil war, and the governments of other middle-eastern countries are under severe pressure. Arguably, these changes were largely driven by the emancipatory power of technology acting as a catalyst of profound social change. Central to the success of these world-changing events is the ability for ordinary people to communicate with one another freely and openly, thus enabling thought exchange and organisation of mass movements. Critically important to this enterprise, was Facebook with its half a billion users, and it is freely acknowledged by one of the organisers of the revolution in Egypt, Wael Ghonim, that he deliberately set out to create the revolution through the use of his laptop and Facebook (Knowles, 2011). The power of the Internet was clearly recognised by the Egyptian authorities which promptly shut off all Internet access to the outside world, only to restore it in the next few days after realising that they were powerless to cut off communications to the world. Of course, change of the kind that occurred in Egypt is a function of the ability to enforce it (having the power to enforce it; the Egyptian people did) and of new ideas, new knowledge, and new understandings (including the understanding that one has the power to act). In other words, the technological revolution is bringing about, for the world at large and people from almost all walks of life, the opportunity to

think in new and interesting ways, to empower people to act, thus enabling them to dare to engage in high-level political and other activities (something not easily achievable before). As a consequence of this empowerment, the world is changing at an unprecedented rate.

More subtle in their impacts are changes in the intellectual and educational worlds. Although somewhat concealed or discreet, they are just as important and point to some educational trends for the 21st century. Eight of the more interesting of these for language learning, at least in my view, are identified and discussed very briefly and will serve to inform the second part of this article.

An unprecedented rate of change

It is almost a platitude to assert that the world is changing at an unprecedented rate (largely through better communication and better understandings often facilitated and mediated by modern technology). Hierarchies are flattening, increasingly placing access, knowledge, tools, and therefore power and the potential to contribute intellectually and in other ways, in the hands of ordinary people. Nowadays, intellectual and other productions can be shared quickly and without hindrance potentially with the entire world (Friedman, 2007). Small voices are being heard more than ever before and they are making a big difference. In particular, social networking is now firmly installed as a major means of communication, information-dissemination and personal and institutional openness, at least on the surface, with all the problems that this entails in relation to

privacy and other matters. The fact that the world is changing so fast means that we cannot be sure of what will happen next week let alone five years from now. This has an impact on needs in general and, in educational contexts, students' needs in particular. What we can be sure of is that we need to be prepared to deal quickly and effectively with unspecified change much of which will be generated by technology.

An unprecedented richness of information

This too seems a little obvious. There is no doubt that the world is more information-rich and communication-rich today than at any time in its history. Information and thoughts on every conceivable subject can be obtained through technological and communication means at a moment's notice and we are constantly bombarded with a multitude of signals about anything and everything, often in multimedia format and with multi-sensory input. From an educational perspective, this means that sources of information need not be limited to whatever can be provided by specific teachers, scholars or universities. Students, if they wish, are now able to access information from a multiplicity of highly reputable sources, not just from text books or lectures provided by their home institutions. Examples of such sources include the TED network (<http://ted.com>) which broadcasts videos of "Riveting talks by remarkable people, free to the world" and Academic Earth (<http://academicearth.org>) which offers free "Online courses from the world's top scholars". These are but two of the thousands of available sources of high-quality information. The information found on these sites may actually be richer, more up-to-date, better justified intellectually and generally of higher standard than that provided by the students' own school or university. Faced with such richness, the problem now becomes that of selection of information, distinguishing between good and bad, valuable and less valuable for one's own purposes. Importantly, information and knowledge are now emanating not only from dominant mainstream sources but also from innovative intellectual outliers. While these outliers still have to prove themselves, or otherwise become "accredited" or at least credible they are no longer buried by those in power and their voices have a chance of being heard.

The universe is interdisciplinary in nature

Despite long-standing academic categorisations (as exemplified by the creation of disciplines or departments which act as bastions of power for affinity groups), the educational world is beginning

to realise/accept that the universe is essentially interdisciplinary and that traditional artificial academic boundaries and categorisations are weakening so as to reflect more accurately the realities of a world with no natural boundaries.

This new attitude is reflected in many universities around the world, e.g. Rice University, in the USA, is instituting a low walls policy in its strategic plan. Half-way around the globe at Rangsit University, in Thailand, the same idea is equally enshrined in its strategic plan as it is for Curtin University in Australia.

The growth of interdisciplinarity means that greater connections are being established between traditionally distinct and compartmentalised areas of study and research.

For instance, interdisciplinary research is now showing strong evidence that a person's native language clearly affects the ways people think and act. In a recent study of one of the Aboriginal languages of Australia published in the *Scientific American*, "empirical evidence for this causal relation has emerged, indicating that one's mother tongue does indeed mold the way one thinks about many aspects of the world, including space and time" (Boroditsky, 2011).

This discovery changes many things and helps to reinstate, at least in part, the previously discarded Whorf-Sapir hypothesis, and attacks the notion of language and cultural universals.

Another example can be found in the work done by the verbotonal group (phonetics, rehabilitation of the deaf and language teaching), in Zagreb, Guberina (1972, 1976) at the SUVAG Centre, <http://www.suvag.hr> and elsewhere (Asp, 2006), which interconnects pronunciation, gesture and movement (including dance) to bring about improved perception and pronunciation of sounds in foreign language learning contexts. A huge amount of interesting work remains to be done, particularly in the area of posture and pronunciation, following the pioneering work by Laurence Wylie (1977) and Carolyn Fidelity (1993a; 1993b).

A further example relates to the clear relationship, now able to be demonstrated by modern instrumentation studies of the brain, between intonation and grammar. While it had long been argued that there was a close relationship between intonation and grammar (e.g. Boomer, 1965), this can now be demonstrated to be unequivocally true through the use of modern technologies, e.g. 'The brain generates its own sentence melody' (Hermann, 2003). That relationship should now be harnessed to enhance the language learning process. An important

realisation emanating from these studies, however, is a more general one, to the effect that we are physiological beings and that physiology should be taken into very serious consideration when dealing with areas such as learning grammar which, *a priori*, do not seem to have any connection with the body. In other words, language learning can be thought of as a whole body activity not just an intellectual one. Looking at it in this way changes how we deal with it (Planck, n.d.). In fact, all aspects of our performance are related to the body. Thinking, pronunciation, crossing the road, all of these activities are necessarily linked to it. Studying the relationship between the body and other phenomena is therefore likely to be critically important to our understandings of how certain fields of study, such as phonetics, can be influenced by other apparently unrelated fields such as posture. The same principle can also apply to other traditional “intellectual” disciplines.

Other areas of interdisciplinarity which are coming to the fore but are still not in the mainstream in language learning (traditionally dominated by linguistics) include critical theory, critical pedagogy, and complexity theory (so-called chaos theory) as applied to organic processes such as language-learning which could help us, *inter alia*, to understand the organic nature of learning.

The central importance of research for all

As the status of knowledge is no longer as stable as in the past, we need constantly to reassess the contributions of the belief systems that we have typically drawn upon to inform our thinking. In today’s world, recreating the stories or principles from the past (i.e. drawing upon traditional views of categories of knowledge) is no longer sufficient. Every school student, every graduate, every professional, indeed everyone who needs to function effectively, needs to be something of a scholar/researcher able to deal with the (intellectual) uncertainties of that world and to contribute to the construction of the future. In universities and schools, this necessarily implies a strong and consistent commitment on the part of academic faculty to genuine personal research. It will no longer be enough to split universities, as we sometimes do now, into teaching universities and research universities. All universities and teaching institutions will need to accelerate and strengthen their research effort. Students too will need to familiarise themselves with research and research practices and universities around the world should give serious consideration to implementing and extending the findings of the

Boyer report (The Boyer Commission on Educating Undergraduates in the Research University, 1998). That report stipulated that undergraduate research should be mainstreamed in research universities but, to meet the needs and challenges of the future, the concept of research for undergraduates, indeed research for all, needs to be extended to all universities and educational establishments.

Having said that, there are indications that students (and society in general) are already harnessing the power of the research tools available on the Internet and elsewhere to meet their personal needs (information, social, commercial). As soon as something is needed people nowadays immediately turn to the Internet for an answer. In effect, people are transforming themselves into researchers, using a do-it-yourself approach. While the information that they glean may not always be what they need, they are certainly learning to be more independent and more resourceful. Furthermore, as people use the Internet tools more extensively, the tools will in fact teach them how to think about the subject of their research, as they will incorporate, necessarily, the specific ways of seeking specific information forced upon them by the search engines: looking for an electrical appliance does not follow the same pattern as looking for information about actions or cultural events. Over time each search engine will acculturate the user into behaviour patterns appropriate for the task at hand. In effect, people are turning themselves into researchers. As educators, our job is to turn them into *good* researchers.

Knowledge, perception and meaning-making

Knowledge construction is understood increasingly as an act of individual meaning-making rather than as an act of information-passing or simple memorisation (A-P. Lian, 2004). Here, perception, in its broadest sense, plays a crucial role in determining the ways in which we understand the world. Essentially, our perceptual mechanisms help us make sense of the present because they act as a storehouse for our past and we use that past as a filter to understand the present. This view is consistent with Derrida’s notion of the deferral of the sign (Derrida, 1982). If we wish to move forward with our understandings of the world, we need to find ways of modifying our perceptual / understanding mechanisms. For this to happen, we need to act on our stored past in order to read the future better or, to put it more accurately we need to act on our present so that in the future, when it has become

our past, it will enable us to act differently and more effectively, i.e. we will have learned something. This complex task seems to encapsulate the essence of the learning enterprise.

The following description, essentially postmodern in spirit, reflects the points just made in relation to educational contexts. It is based on a reflective piece which serves as the foundation for the development of a rhizomatic model for language learning (A-P. Lian, 2004) and will also serve as a partial introduction to the final part of this article.

As we go about our daily activities, we are constantly engaging with complex multi-sensorial signals which we relate to our personal internal logical and representational systems [the filter of our past, our history, our habitus (Bourdieu, 1995)] in order to produce meanings which, in turn, empower us to act. As explained above, in this model we never access reality directly but only through the filter of our past which tells us what is relevant. Thus, while the act of understanding is always individual, it is shaped by the practices of society in interaction with us. Meaning is constructed internally through a process of convergent inferences from multi-channel experience and feedback. A useful way of thinking about this is that we are essentially sense-making machines in constant need of generating understandings in order to be able to function during every moment and every context of our daily lives. Meaning-making is an integral part of the human condition. The act of learning is not different from that in essence. In order to learn, we have to make some kind of sense of what is presented to us or what we observe. Without such meanings, we would be incapable of learning anything.

Now, for learning to occur the students need an effective way of distinguishing between their understandings that work and those that do not (and therefore need to be dealt with). We can think of this clash of understandings as the core of "learning needs". Learning needs become identified when students' current meaning-making mechanisms fail to resolve problems encountered as they seek to accomplish specific tasks. When this happens, some sort of intervention is required. Given that each student's history (and therefore meaning-making mechanisms) is significantly different from those of his/her peers, the difficulties that they will encounter are also likely to be different, unpredicted and unpredictable, and will require specific assistance tailored to the individual student and will lead to the personal construction of knowledge organically rather than

according to some arbitrarily predetermined sequence.

Thus, for best results, ways of dealing with unpredictability should be built into learning systems and provide (a) an opportunity to identify learning needs and (b) an opportunity for students to address learning needs both autonomously and with help. This is a very different model of learning from that normally offered by schools, universities and textbooks where learning sequences and paths through knowledge are predetermined and where everyone is supposed to traverse set knowledge in lock-step synchrony.

The power of social networking

There is good evidence that we learn well (some will say best, e.g. Robinson, 2008a) in groups when we collaborate and interact with others and receive feedback. For instance, "[...] in a collaborative learning setting, learners have the opportunity to converse with peers, present and defend ideas, exchange diverse beliefs, question other conceptual frameworks, and be actively engaged." (National Institute for Science Education, n.d.). While this describes collaborative learning in formal settings, the emergence of social networks offers an added and highly significant dimension.

Take the following example (A.B. Lian, 2006): The *Thai News Network* (TNN) project conducted at Khon Kaen University, Thailand, with first year undergraduate students of Thai. The overall objective was to enhance students' critical reading and writing skills (Buranapatana & A. B. Lian, 2002). Students were required to establish a news channel. The intention was to create and support an educational platform where critical investigation triggered a process for students to engage not only in the criticism of texts but also to enhance their interactions with people with a diversity of interests and belonging to the community at large.

To achieve this, students developed a web-based information channel. Within the three-month duration of the project, they created thirteen articles reporting on different issues relating to social, political and scientific issues. Students advertised their website around the university, among other students, with teachers from different subjects, and the community in general. They obtained email feedback from hundreds of readers. They also established a discussion forum. Thus, the project allowed students to approach the task of writing in a manner where success did not depend on teachers' judgments alone, but on their ability to participate in, and generate, negotiation among

members of the general public who, as a result, provided them with both expert and non-expert feedback.

Students reported learning many skills including the courage to talk to people from other towns or villages or other universities. They also developed a professional attitude toward their own work, and learned to seek out information. They learned to understand the power of informed participation.

While the social site set up by the students was far less powerful technically than systems such as Facebook (pre-dating it by two years), it nevertheless demonstrated the value of interacting with people from all walks of life, resulting in enhanced critical awareness and thinking together with enhanced literacy skills (in Thai, the students' native language).

The need for creativity and divergent thinking

Given the preceding, there is a clear need for a focus on creativity from both students and teachers. Dealing with such a broad range of new and different areas simultaneously, over the entire period of our lives (lifelong learning), will require equally new ways of thinking and dealing effectively, and at short notice, with issues and problems. Research will address some of these, but research alone is not sufficient as research models can become outdated and routinised. We need to become increasingly adaptive and creative and think creatively and divergently in order to maximise outcomes. At first glance, this may appear obvious, yet there is disturbing evidence to suggest that the educational system (perhaps the rise of standardisation or standardised testing (Robinson, 2008b), which is likely to get worse, at least in the USA (Krashen, 2011), or perhaps just "life") tends to make people conform and lose creativity. This is the view of people such as Ken Robinson (2008b) and Larry Vint (2005), and they are not the only ones. Both quote a major longitudinal study by George Land and Beth Jarman (1992) indicating that, over time, creativity is unlearned rather than learned. Land and Jarman (1992) discovered that at five years of age 98% of children scored in the 'highly creative' range of a standardised creativity test. Five years later the same children scored only 30%. Five years after that their scores had dropped to an alarming 12%. They also discovered that the scores for 280,000 adults of 25 years of age and older was only 2%. This is a disturbing but, perhaps, not totally unexpected finding, as it seems to reflect processes of economy of effort and growing conformity that occur in us as a normal consequence of everyday

life. This finding could explain, at least in part, the blockages which reduce our ability to learn a second or foreign language. If this trend is still continuing today (the original study was published in 1992), then in an increasingly diverse and complicated world, moving at a faster rate than ever before, this is a dangerous state of affairs, which needs prompt attention.

Encouragingly, there are signs of change at least in the ranks of bold and imaginative educators.

For Ken Robinson, part of the answer is to find your passion, the Element as he calls it (Robinson, 2009): "We all have different aptitudes and we have unique passions[.] The challenge is to find them because it is in the fusion of both that we live our best lives". In Robinson's terms this implies being highly creative (Robinson, 2011).

For others, like Angela Maiers, it is possible to create passion-driven education through a classroom environment which she helped to implement with good results (Maiers, 2011). Teachers got to know students' "*passions, gifts and talents*" rather than assuming some kind of uniformity of interests and purposes, and used this knowledge to enhance the learning process. The trick is in the creation of the environment that will release the passion and enhance the process.

For others again, the way to creativity is through small-scale but precise radical change (perhaps facilitated by technology). At Michigan Center High School, teacher Dan Spencer changed practices in the classroom on the basis of an idea from two teachers in Colorado: Jon Bergmann and Aaron Samms. Instead of lecturing in class and letting students do homework at home, Spencer used technology to create screencasts of his lectures which students watched at home. Class time was used to do "homework". He could now spend extra time helping students one-on-one (Stansbury, 2011).

Significantly, and perhaps surprisingly, creativity is now being promoted by some of the popular media. One of the most popular channels in the United States, the USA network, is actively engaged in promoting creativity through its "Character Approved" honorees program which recognises the contributions of creative people who are "shaping our culture". And channels which enjoy such a high level of popularity have the potential to place the notion of creativity in the minds of millions of people. This is a remarkable engagement in cultural activity by a channel which, typically, specialises in soap operas, television serials and movies.

It is clear, then, that despite fears to the contrary, creativity does manifest itself. The question remains, though, as to whether it is sufficiently widespread to make a difference and whether the systems currently in place are able to support creativity in a general sense and make it available to the entire community of students. One suspects that the answer is probably “no”. Educational systems, on the whole, tend to be somewhat resistant to and suspicious of change, and, seeking to bring about a paradigm shift is always extraordinarily difficult and requires both faculty and regulatory authorities to embrace it.

More power to the students

Just as in the case of ordinary people exercising political power resulting from changes in society and technology, students have increasing power in education in terms of access to knowledge and the ability to make choices about how to deal with such knowledge. They are no longer limited by their teachers’ knowledge or control of access to information. Quite importantly, they may even be able to create their own learning resources or learning materials according to their needs. For example they may be able to choose or perhaps even construct their own textbooks, with or without help, using systems such as *Connexions* (<http://cnx.org>) developed at Rice University by Richard Baraniuk (Rubinstein & Bernard, 2007). *Connexions* is for both authors and students. Here “authors create or collaborate, instructors rapidly build and share custom collections, learners find and explore context (*Connexions website*)”. Materials generated can be printed in the form of books (through on-demand printing technology), thus enabling textbooks with very specific content (and no waste) to be produced at a sale price to students of between 10% and 30% of less flexible commercial equivalents.

Following the same logic are systems for enabling students to construct their own lessons. For instance, a proof of concept example designed to teach intonation by drawing on authentic audiovisual materials, *MMgen*, was developed by the author. Students are provided with a video recording whose different intonation patterns have been indexed and made available according to certain identifiers. Students can then dynamically construct their very own intonation lessons according to their needs and a set of appropriate parameters (e.g. choice of pattern, contexts, words, etc.). They have the option of listening to the original recorded utterances, listening to the utterances through a digital filter [a low-pass audio

filter set at between 320 Hz and 415 Hz so as to highlight the intonation patterns and reduce processing load (A-P. Lian, 1980)], listening to the utterances in context or listening to the entire recording. In due course, the generated lesson would be linked to other lessons which may also be under student control (A-P. Lian, 2004). While access to such tools is very valuable, once needs have been identified, needs are not always visible. Students will need access to environments able to elicit known needs and (even more important) unknown needs, as pointed out earlier. Suitable environments are created when students are able to confront their current state of knowledge against complex tasks to be accomplished. As they perform activities, they discover what they are lacking (i.e. their needs) and seek and receive appropriate help.

One such environment is called *Macrosimulation* (Mestre & A-P. Lian, 1985) [the concept was later re-invented independently as *Simulation globale* (Yaiche, 1996)]. A macrosimulation is a long-term simulation where participants create for themselves a virtual living environment, e.g. a French village. They “build” houses and other buildings, generate local institutions and adopt appropriate ways of life. They select personae, determine their characters and act out their roles for significant amounts of time, e.g. a whole semester. After a while, they develop a sense of their own history in the simulation and their personal stakes change: they are no longer just doing an exercise, their “self” is at stake (Mestre & A-P. Lian, 1985). In that environment, language and culture are tightly integrated, are interactively related to one another, and are learned simultaneously, with culture acting as the primary contextualiser of both linguistic and non-linguistic activity.

Most importantly from a learning perspective, macrosimulations provide an operational space where collisions occur between each learner’s logical and representational systems and the tasks to be performed, thus generating needs to be dealt with by acquiring new knowledge or developing new strategies. Students can then get individualised feedback and move forward at their own pace using advanced approaches such as that emerging from Pannathon Sangarun’s research on the cognitive pre-task planning process (Sangarun, 2010).

Significantly, also, this environment encourages, indeed can demand, (a) creativity, in order to deal with the complex and unexpected activities which may crop up; (b) passion, it provides excellent opportunities for students to

engage in activities that really matter to them; (c) choices, by its very nature the environment requires people to make decisions about what activities to engage in and how: power is clearly placed in the hands of the students and they are ideal environments for students to capitalise on facilities for creating their own learning resources, e.g. books or lessons.

In other words, environments like this seem made for the 21st century and are mirrored, to some extent, in the recent development of three-dimensional virtual worlds such as *Second Life* (<http://secondlife.com>) which provide the ability to create realistic, visible and manipulable spaces for human engagement and the activation and expression of imagination, creativity and passion.

Toward a rhizomatic model of language-learning

The trends and features identified above are applicable to all educational systems. They are transformative in nature. They are evolutionary rather than revolutionary, as well as organic in essence as they are the product of slow change (even though not widely implemented) and, arguably, represent the next logical step in educational progress. They are also coherent with one another and converge to suggest a solid structure for generating comprehensive teaching and learning systems.

The next part of this article provides a very brief and abbreviated overview of the potential design of such a system in the context of language learning through the implementation of a model called generically: a rhizomatic system for language learning (all still work in progress). The system, partly based on A. B. Lian (1996), was described initially in A-P. Lian (2004) and in subsequent presentations at various conferences (at times with J. A. González) and focused on support structures (A-P. Lian & Gonzalez, 2008).

Conceptual structure

The conceptual structure of the system is simple and consists of three layers:

- (a) a guiding intellectual framework
- (b) an operational space and
- (c) support structures and associated conceptual and physical resources and tools.

These layers are similar to the minimum requirement for any learning system. The difference lies in the content of these layers.

A guiding intellectual framework

Initially, the guiding intellectual framework was developed on the understanding that all meaning is personal and individually constructed as identified above and subject to individualised intervention. This introduces the notion of the rhizome as a fundamental structure in the model. A rhizome is a term from botany which has made its way into the critical theory literature. Conceptually, it is like the root of a ginger plant whose parts have no obvious and clear connecting points. Instead, every point is potentially connected to every other point. Below is a figure representing (in simplified form) some rhizomes:

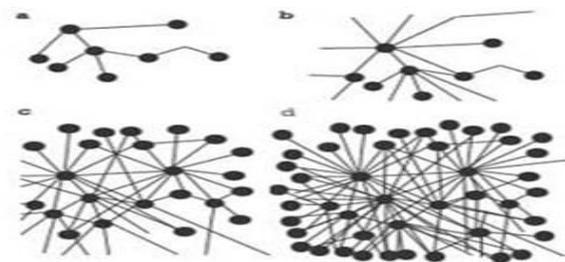


Figure 1 Rhizomes

A rhizome can be thought of as consisting of a set of conditions which allows for multiple, non-hierarchical entry and exit points in data representation and interpretation (Deleuze & Guattari, 1987). This is the very antithesis of a tree structure. A rhizomatic structure can be thought of as a structure which contains components where each and every component is connected to each and every other component of the living, i.e. organic and potentially infinite, structure. Within a learning structure, this means that students are able to connect from any activity or information point to any other activity or information point according to perceived need. A rhizomatic structure should not be thought of as chaotic but rather as a self-regulating structure responsive to the learners' needs as determined by the mechanisms in place (human or otherwise) for determining such needs. The rhizome is a critical feature of the language learning system to be described (A-P. Lian, 2004).

Thus, in a rhizomatic system, whatever path students follow will be determined by the needs that they identify or negotiate with teacher, advisors or even technology as they attempt to perform cultural and linguistic tasks. Students entering the system engage in complex tasks which create confrontation between their logical and representational systems and the task requirements.

In doing so, their needs will emerge, they will be identified and, subsequently, will be supported by human, material or technological resources.

An operational space

A macrosimulation operational space (see above) was selected as the space for needs-generation in view of the author's familiarity with it and his previous success using it. That environment also has the advantage of offering considerable student autonomy, thus empowering students to be active both in tasks and in problem-resolution. Macrosimulation also enables them to engage in countless creative activities and, furthermore, it can accommodate to change very easily.

Support structures

Support structures can come in many shapes and forms. They can consist, for example, of teachers, books, other students, external contributors. However, given the current state of technology and the strong personal research and do-it-yourself attitude (potentially) of current students and likely future students, the primary support structure envisaged is technological and will come in two forms.

- (a) Technology-based help systems constructed on multimedia databases (originally proposed in A. B. Lian, 1996) containing information and lesson materials drawing on both authentic materials and pedagogic materials and
- (b) Social networks comprising of other students, expert teachers, expert managers of the systems in (a) above, native speakers and other interested parties.

Significantly, the support structures just described are not restricted to rhizomatic models of learning. Potentially, they are of universal value, no matter what approach one uses and, therefore do not require macrosimulation as a front-end.

Technology-based help systems

In trying to solve the needs of students we are faced with an unordered set of demands and questions which can, potentially germinate at any point in the process of learning and connect to any

other point in that process. In other words, needs are unpredicted and unpredictable. To meet those needs, technology-based help systems should provide support structures which reference rich resources and (especially given today's do-it-yourself world) enable learners to find answers to their questions for themselves. They should also provide links to other rich resources and support systems which might lead students on a profitable serendipitous journey of discovery.

Tools should offer support in at least the following areas: (a) information and awareness-raising, (b) guidance (e.g. hints for language and culture use/learning) and (c) new opportunities (connections and links to other resources and lessons leading to curiosity/serendipity-based learning).

These systems should also be plentiful, abundant and varied in nature so as to respond to students' preferred learning styles. Wherever possible, they should offer rich feedback extending beyond the problem at hand.

They should also enable students to ask questions, maybe not questions such as: "How do I greet my friends on Sunday morning?", but perhaps something more like: Show me 'greetings' between 'friends' in context X at time Y (all accessed through dropboxes or keywords).

They should actually *show* language in action (they should play video) and, if possible, enable learners to change the conditions of the situation to see what impact that might have on the language or communication.

At the heart of the system would be a multimedia (primarily audiovisual) database with a good human interface containing authentic materials, quasi-authentic materials and pedagogic materials.

While learners should be able to interrogate the database directly, it should also be possible for it to be accessed by other programs and to act as a source of materials for them. This combination of features provides the infrastructure for a properly rhizomatic learning structure, offering a large number of possible entry and exit points.

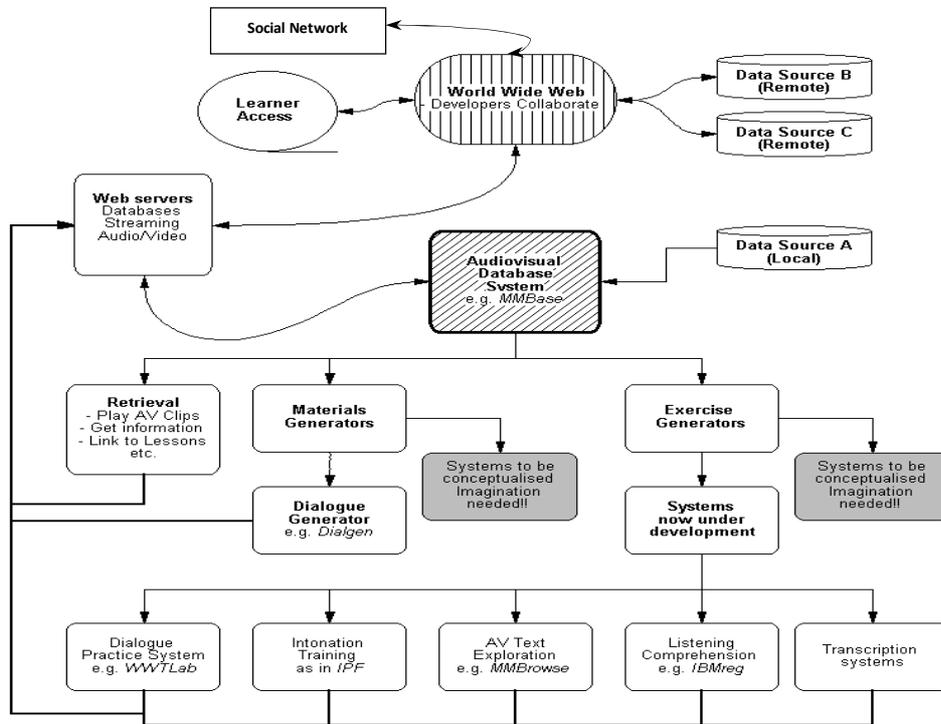


Figure 2 Partial map of a possible help system

Figure 2 above displays an example layout for a help system and includes programs extending the database’s capabilities.

In the top layer, students connect to the World Wide Web, specialist social networks (if needed, see below), and data sources which they interrogate according to their needs. Requests are referred to the database (*MMBase*) and responses are provided directly. Students can also be connected to other sources of information and to lessons. This is provided primarily by the third layer which retrieves information or enables students to generate their own materials (e.g. the dialogue generator *Dialgen*), to generate lessons or connect to lessons provided by the fourth layer: listening comprehension (*IBMreg*), text exploration (*MMBrowse*), intonation training (*IPF*). Many of the programs make use of multi-sensory input, sometimes modified so as to optimise students’ perceptions and reduce their processing load (e.g. low-pass filtering of natural sentences is used to heighten students’ perceptions of intonation patterns and to activate right-brain processing for enhanced learning of intonation and grammar).

Social networking

In addition to a self-managed technological infrastructure, a human infrastructure is required, a

kind of helpdesk. There are many reasons for this. Most importantly, it is essentially impossible for the technology-only systems to contain answers to all possible questions. There will be many instances when students need to discuss their requirements with expert humans to get immediate answers to their requests. An important side-benefit is that queries made can be fed back into the system and will enrich the database for future users. Thus, the amount of online information will keep growing, will become increasingly richer and will meet the needs of more and more students. A helpdesk would be a valuable front-end for students and for system development.

However, given the acknowledged value of collaborative learning and the recognition that much learning is social, it seems highly desirable to extend the human connections of students beyond the helpdesk to include other people. These could include other students with similar difficulties, teachers able to give feedback and advice, native speakers who could converse and interact with students and help them in unexpected ways, and other language and culture experts who would be able to contribute in much the same way as in the case of the Thai News Network discussed earlier. Such contact could occur through chat rooms, face-to-face videoconferencing, virtual classrooms, and interactions in virtual worlds. It is

not impossible to imagine that the social dimension of a rhizomatic system as described could become very large as it is possible to envisage not just a local learning network but, for greatest advantage, a worldwide network of systems capable of supporting thousands of students at any one time all of whom would be keen to engage in social interaction in support of their language-learning.

An example interaction

The following example may help to clarify the processes involved. Let us imagine a group of English-speaking learners of French. They have a specific problem to solve: they need to find out the workings of yes-no questions in French. They get together in person or virtually and engage in the following activities.

- First, they query the system according to selected criteria using the built-in interface (e.g. show how yes-no questions work when two people greet each other. They have a particular phrase in mind: “Ça va?” – How are you doing?).
- The database returns a list of yes-no questions in their original contexts.
- They view extracts from multimedia documents (perhaps movies, or interviews or other forms of authentic interactions) containing the items of interest. Each instance listed is accompanied by significant information (ranging from cultural comments to analysis of gesture).
- Students observe the contexts of use and cultural information and discuss how yes-no questions seem to work.
- Because of the richness of the media used, they identify and compare further instances of questions. In particular, they now compare the workings of yes-no questions with information questions, but decide to use only a particular movie which captured their interest.
- Intrigued by what they have discovered, they decide to expand their search beyond questions and to examine how greetings work in general (within a specific movie).
- Instead, however, they get caught up by the movie that they have been watching and decide to view it in its entirety.
- As they view the movie, they stop at various points to check that they have correctly understood the events of the film. They do so by responding to some short comprehension questions.

- Remembering their original purpose in interrogating the database, they request the system to generate individualized lessons according to specified parameters.
- They leave their immediate task, but have some unanswered questions. Three hours later, two of them send a joint query to the system’s social network. Five hours later, they receive answers from their teacher, from a language expert who works on the system and from two native speakers (with whom they correspond in French). Over time, other people respond and a collection of data constructed around their query is built up, indexed and published.

This example illustrates the rhizomatic nature of the experience. An arbitrary entry point was selected. It happened to be a grammatical/intonation structure, but it could also have been a function (e.g. a greeting) or a genre (e.g. an advertisement), a gesture or a facial expression (e.g. a raised eyebrow). The students engaged in a self-directed serendipitous adventure supported by self-constructed lessons which enabled them to establish a form of dialogic inquiry between themselves and the various texts with which they were interacting. The path that they chose to follow was not pre-established but was made possible by the availability of the database, its speed of retrieval and the communication systems connecting it to the students and other systems. Importantly too, the students were able to have *their* questions answered quickly, efficiently and effectively in a rich and engaging way at a time and place which suited them, with a minimum of effort on their part or the part of others. As a bonus to every user of the system, new learning data were made available to the benefit of *all* participants in the system (including educational and other researchers with access to the interactions and stored information).

Conclusion

This paper has sought to review and reflect upon developments in society, technology and language-learning systems in the 21st century. It offered a conceptual model of language-teaching and learning which recognises the centrality of individualised meaning-making in the learning process in general and language-learning in particular and proposed solutions consistent with perceived social and technological developments in the 21st century. These solutions, which revolve around eight trends/directions, engender, *inter alia*,

student autonomy. Furthermore, the solution of student-driven rather than teacher-driven communicative needs can be used not only for short-term language and culture education but also in the context of language maintenance and lifelong learning. Much more research, both intellectual and developmental, remains to be undertaken in order to implement and test the functionalities, effectiveness and practicalities of each component of the system and, ultimately, of the system as a whole.

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