

Rhizomatic Learning: “As... When... and If...”  
A Strategy for the ASEAN Community in the 21<sup>st</sup> Century

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### Abstract

The article begins with developments in the ASEAN region. In particular, it focuses on demands generated by the goal to build an ASEAN Community characterized by great diversity amongst member countries. The demands created by this diversity are exacerbated by the immense changes taking place in the 21<sup>st</sup> century, such as unprecedented richness of information and communication systems, unprecedented mobility and the technological empowerment of ordinary people to create or find their own personal solutions in a just in time, just enough and just for me fashion. This leads to the conclusion that learning needs will be vastly different, individual and largely unpredicted and unpredictable. This realization implies the necessity to develop adaptable, flexible, yet intellectually coherent learning frameworks which will provide the necessary guidance for creating appropriate learning environments. The article proceeds to construct such a framework on the basis of a five-point analysis of how human perception, understanding and knowledge-construction operate. It then develops a learning structure based on the generation of personal learning environments (PLEs) connected to a networked information technology infrastructure which is essentially rhizomatic in nature (i.e. where learners determine the ways that they navigate through information and feedback mechanisms to construct personally-relevant and appropriate knowledge). The article ends with a short scenario to illustrate the workings of this structure and concludes with some remarks about current research in the area in both Asia and Europe.

**Keywords:** ASEAN, adaptable learning, rhizomatic, personal learning environment, autonomy, individualization

### **Introduction**

It was in the early 1950s, after World War II that a group of European countries including Belgium, France, Germany, Italy, Luxembourg and the Netherlands attempted to resolve peace conflicts and create an agreement of economic and political cooperation. This was the beginnings of the European Community. (Europa, 2014)

European cooperation moved through the years in a confidence-building exercise that led to the 1989 “common market” arrangement of free flow of goods. By 1993, European cooperation reached its maturity and came to a stronger and clearer agreement from its now fifteen members. It was agreed that there would be four freedoms, the movement of goods, services, people and money together with a shared interest in protecting and preserving the environment.

It is in a similar spirit that ASEAN was established in 1967. Five countries in Southeast Asia led by their Foreign ministers: Indonesia, Malaysia, the Philippines, Singapore and Thailand, forged the Association of Southeast Asian Nations, better known as ASEAN. The aim was to build continuing cooperation in “economic, social, cultural, technical, educational and other fields” and to maintain stability in the region. (ASEAN Secretariat, 2012). In 2003, the then ASEAN together with additional member nations, Cambodia, Laos, Myanmar and Vietnam, forged an agreement to transform itself into the ASEAN Economic Community (AEC) by 2020. To realize the AEC vision in 2020, measures are being set in place to deepen integration, to make ASEAN stronger and more dynamic and to increase the potential for opportunities. The AEC transformation is rolling out a “single window” platform to enable the liberalization of trade and goods while customs procedures will be simplified and harmonized. The AEC will also liberalize movement of services, from education to professionals, making ASEAN more effective and more competitive. (Pitsuwan, 2013) Services are to include banking, hotels,

education, and telecommunications among others. The AEC will adopt “the principles of an open, outward-looking, inclusive, and market-driven economy” (ADB, 2013, p. 6) to support all member nations and highlight peace, prosperity and the people. (ASEAN Secretariat, 2011)

As the region strives to achieve its considerable potential to become a strong, cohesive block of synergizing countries, it recognizes the need to prepare ASEAN citizens for inclusive development that will encompass many aspects of education and training: trade skills, digital literacy and productivity, knowledge sharing, knowledge management, cultural adaptation and respect for work values, language learning, sharing best practices and developing cooperative yet competitive mindsets. Current and emerging technologies have implications for all these inclusive developments.

The ASEAN Master Plan for connectivity that complements the AEC 2020 vision has clearly outlined the immediate development of ASEAN Virtual Learning Resource Centres (AVLRC), the development of ICT skill standards and the ASEAN Community building programme among its fifteen priority projects. (ASEAN Secretariat, 2011b) This will lead to the fast-track creation of ICT skills and competency centers, programs and standards. How ready are the ASEAN citizens?

If we take account of the dynamic conditions and great diversity of the ASEAN group of nations, there is clearly a significant need to build skills and competencies for the near future even though the current (quasi-) exponential rate of technological change that we are experiencing makes it impossible to predict the kinds of job skills and other life skills congruent with that short-term future. What is relevant in this dynamic context is the necessity to develop strong personal learning competencies and relational mindsets in the ASEAN population.

Both learning competencies and relational mindsets are in fact actually developing in ASEAN society in a more or less organic way and are essentially cultural and specific to the region. As a consequence, modern ASEAN educators are faced with the obligation to develop flexible and adaptable teaching and learning systems capable of dealing with the great variety of learning issues generated by the demands of regional diversity.

At the same time as these phenomena are occurring at the regional level, a number of important global phenomena are occurring in society all over the world.

### **Characteristics of 21<sup>st</sup> Century Education**

First and foremost, the world is *changing at an unprecedented rate* because of *an unprecedented richness of information* and an *unprecedented richness of communication systems* (Lian, 2011). Nowadays, not only are mainstream dominant voices heard but, at least potentially, so are those of the intellectual fringe and of “little” people everywhere (even the digitally deprived have some access, albeit tiny, to communication networks). As a planet we now have more choices than ever before, and the average individual has more “power to know” than ever before. Much of this empowerment and emancipation has been generated by the exponential growth of modern communication and storage/retrieval systems accompanied by the subsequent flattening of power structures driven largely by the growth of the Internet (Friedman, 2007). In this scenario, a critically important agent of change has been the development and growing *power of social networks* such as *Facebook* (deemed responsible for the fall of the Mubarak government in Egypt in 2011 (Knowles, 2011). These developments also mean that information and decisions are more prone to popular review than ever before, not only by one or two dozen privileged individuals but by millions, perhaps even billions, of people who previously had no access to such materials. As a consequence, the world is democratizing,

sometimes even against the will of governments which are effectively helpless in the face of these changes.

Accompanying these developments we also find *unprecedented mobility*. People are travelling more and living away from their traditional home bases, their “hometowns”. This has special relevance in the ASEAN context which highlights employment mobility as one of its major objectives. Once people become mobile, they will need to learn new languages (even if English is the official language of the ASEAN community, knowing only English will not suffice) and they will have to adapt to new cultures, i.e. new ways of thinking and understanding, in order to be successful in their everyday lives as well as in their professional lives. As a result, they will be required to deal with countless unpredicted and unpredictable real life problems occasioned by changing circumstances. To overcome these problems they will need to engage in new forms of learning which must be able to respond rapidly and adaptively to their specific needs as and when they arise. This unpredictability, coupled with the power of technology, has given rise in both the community and elsewhere to a form of learning referred to as: *just in time*, *just enough* and *just for me*. Learning will happen (is already happening) *when* it is needed (just in time and using the latest available information), *in sufficient quantity* (just enough) *to solve their specific problem* (just for me – resources/information tailored to the learner’s needs). This is one of the new characteristics of learning derived from recent technological change and it contrasts with the traditional view of education where a specified body of knowledge was taught *just in case* it were needed some day. Nowadays, even if one did teach in a “just in case” perspective (and many still do), there is a serious risk of failure as the rate of knowledge production, especially in technical areas, is so high that some or all of the “just-in-case” knowledge might actually be outdated by the time a course of study is completed. Of course, this

cannot be a blanket rule as some forms of knowledge are more stable than others by their very nature.

Furthermore, we are now encountering what might be called the generalized growth of a *research mentality* or even of *community intelligence*. This seems due very largely to the availability of sophisticated search engines (e.g. Google, Bing, Yahoo). Almost universally, whenever people have a problem to solve or require information they consult Google or some other search engine well before turning to an expert (if ever). As evidence of this, we see that the number of hits on all search engines in just the United States in January 2014 reached 19.6 billion. Google alone accounted for 13.2 billion searches (67.6% of the total) (Comscore, 2014), attesting to the fact that the performance of personal research is growing at an amazing rate. This has created consternation in some quarters, generating fears that we will stop remembering information but simply remember where to find it (Sparrow et al., 2011). While it is actually true that the rate of change of knowledge makes it impractical to rely on our memory for up-to-date information we need to remember that this phenomenon is simply a reflection of our evolution and society will adapt in much the same way as it adapted to calculators and motor cars and other technological developments in the past. More important though is the growing realization that people need to learn to reflect critically about the mass of information provided by the search engines and one of the roles of educators will be, inter alia, to assist people to learn how to identify and select information of value. While search engines have indeed placed much power in the hands of ordinary users, there is also a serious potential risk that the kinds of information offered may be biased, the reasons for such bias ranging from commercial profit to ideological manipulation by the owners of the search engines in question. In this scenario, knowledge, instead of being controlled by experts, as in the past, runs the risk of being controlled by large

corporations (or even governments) which will provide and, necessarily, filter, monitor, ration and otherwise potentially manipulate what the public is allowed to know, and how it is presented.

Some of the risk just identified above is at least partially offset by the *power of social and professional networks* where individuals are able to obtain advice and exchange ideas, including advice regarding how to deal with information gleaned from search engines. Social and professional networks also provide powerful opportunities for developing a reflective attitude toward life, partially or fully compensating for lack of specific knowledge by participants and, most importantly, for learning to see things differently, thus enabling intellectual progress to happen (Max Planck: “Change the way you look at things and the things you look at change”, n.d.). The power of connecting people to each other is also reflected in such phenomena as the growth of serious online research through game-playing e.g. the *Foldit* game (<http://fold.it/portal>) where biochemical problems such as protein-folding have been solved by the public (consisting of people from all walks of life) whereas the solution had eluded expert scientists for more than 10 years (Gray, 2011). Faced with their own frustrations in not finding a solution, scientists invented a game to multiply the number of brains attacking the problem – and it worked: a solution was found in a wonderful example of *community intelligence* at work. This phenomenon heralds an important shift in our intellectual arsenal from *independent* thinking/learning to *interdependent* thinking/learning: we are no longer alone in our efforts to learn, something that educationists have recognized increasingly: we learn best in groups.

With people taking charge of their personal information needs, it is arguable that they are automatically learning to become researchers and engaging in research activities albeit at many different levels of sophistication: an important educational development. In the frame



below is an illustration of this kind of development in a study conducted by Pineda and Bernhadsson (2012).

*A Great Learning Experience: a 21<sup>st</sup> Century Learning Experiment*  
(Pineda and Bernhadsson, 2012)

From June to December of 2011, a study was conducted by Pineda and Bernhadsson to gather short two-minute videos encapsulating student experiences of what they consider as “a great learning experience”. The study went through a conscious planning and orientation of the students. The two cohorts of students have technology know-how, the first set was information system students from Manila, Philippines and the second set was digital media students, from Trollhattan, Sweden.

Some of the significant findings indicated that first, if the students or the learners were made to understand and reflect on the purpose of what they will do like in this video experiment, the outcome proves that learning is contextual and personal rather than social.

Second, the learner is able to define her learning priorities as well her preferred learning activities. There is significant gratification when she is able to perform learning by herself. This means she has her methods and ways of pulling knowledge or information and carryout deliberate learning actions. At the same time, having access to technology that she is able to source and select the tools that will support her learning tasks.

It is also significant to note that the students, given the proper planning and orientation, they can freely determine which are the effective and affective learning experiences for them, and that generally, these experiences were derived from their personal learning experiences.

Hence, this study strongly suggests that a deliberate induction of the importance of defining one’s personal learning environment, accompanied by the tools, technologies and all learning artifacts around, would be a critical role of 21<sup>st</sup> century education systems.

An understanding of the potential of the above factors and their related complexities lead us logically to understanding that there is a need for creative and divergent thinking to maximize this potential. Disappointingly, there is also evidence that educational systems, especially with their emphasis on standardized testing, are stripping creativity out of society and

transforming highly imaginative children into conformist adults (Land and Jarman, 1992; Vint, 2005). Also disappointingly, there is further evidence that while people and organizations say they welcome and value creativity, they also resist it vehemently (Mueller, Melwani and Goncalo, 2012). Educational systems will need to navigate through these developments.

The combined effect of these trends, heavily influenced by computer-based technology, has resulted in the empowerment of the people who have the technology to solve many problems previously beyond their reach. This empowerment has been embraced with surprising alacrity by the general public thus demonstrating the readiness of the population to take charge of its own problems and to exercise both freedom of action and independence of thought. In a sense, this is the “natural” thing for humans to do: we like to control our own destinies. While we have recognized this love of independence in many areas of ordinary life, such independence is not commonly offered in the educational world where tight control still tends to be exercised by governments and academic institutions such as universities, colleges and schools – usually in the name of quality control and the setting of standards.

### **The MOOC phenomenon**

There are, however, some signs of change, once again under the impetus of technological development. Such change is symbolized by a relatively recent phenomenon in publicly accessible education: the growth of MOOCs (Massive Open Online Courses). A MOOC is characterized by the following (fairly obvious but important) features. It is Massive: it has huge numbers of students often organized in forum and discussion networks. It is Open: often free of charge but often also free of time constraints, with flexible commencement and completion dates, and often free of accreditation requirements. Typically, it is not connected with any accreditation or certification system. It is Online: which means that it is easily accessible all

over the world and it is a Course: containing large amounts of teaching materials and activities - often videos of lectures - with assessment of the material taught. This feature also signifies that this is one area which is NOT open and where, somewhat paradoxically, people's choices are controlled, limited and constrained in a traditional way.

The strengths of the MOOCs consist of their flexibility of access (including availability), their low cost (so far), their social nature, their lack of academic credit i.e. the lack of obligation to pass tests, and the fact that they are often taught by "famous" people.

It is particularly interesting to note that, while very large numbers of people enroll in MOOCs, the dropout rate is also very high – typically around 90% (Jordan, 2013).

So what does this mean? First and foremost, and most importantly for society in general, it is clear that there is considerable public demand for education (otherwise people would not enroll). Such education needs to be affordable: MOOCs are usually free. Third, education needs to be easy of access, as are MOOCs. And academic credit is not a priority: MOOCs do not demand academic credit. In short, and encouragingly, people seem to value education for its own sake. Those who enrol seem to do so out of interest and do not seem to need or care much about academic credit. Taken together, the lack of obligatory accreditation (i.e. low/no stress) and the low cost means that people can take the of risk enrolling and either learn something needed for their lives, indulge their curiosity or simply have intellectual fun: all are good. Given the degree of participation in everyday social networking, people may also be attracted by the social aspect of MOOCs and enjoy, and benefit from, the stimulating academic/intellectual discussion sessions. In a surprising way, education may have found a kind of niche in people's world of entertainment. The high dropout rate seems to indicate that all of these factors may be relevant. Nowadays, people can actually afford the risk of "trying out" education and are able to treat it

with various degrees of seriousness. Not surprisingly, this analysis reflects and confirms trends identified earlier, in particular, and most significantly, the “just in time, just enough and just for me” basis of course selection and attendance. It is even possible that this aspect of modern life may account for the dropout rate: once the course has outlived its usefulness, or its fun, it is simply abandoned.

Thus, the MOOC phenomenon signals both an opening of the academic world to the “ordinary” person and the existence of a latent interest in society for education. In a nutshell, education is valued more than we might think, but it is not education in its traditional form.

The next part of this article responds to the above considerations by proposing a general model of learning supported by technology and capable of simultaneously meeting society’s unpredicted and unpredictable learning needs through both individualized and/or social intervention. This makes it of particular relevance to ASEAN contexts.

### **The PLE Framework and Guiding Principles**

The model we propose is based on five quasi-axioms, or principles, that all of us might arguably agree on. They are:

- (a) *We (human learners) are physiological beings* (this forms the basis for the other principles). We are “embodied”. Even allowing for a spiritual dimension to the concept of mind, our consciousness, our mind, is primarily enclosed in and isolated by our body. Communication between mind and physical world is necessarily mediated by the nervous system which is fundamentally fragile. It can be affected by physical circumstances such as injury, drugs, medications and, most importantly, our past, our operational history. Thus, a sensation, a smell, is not observed “objectively” but generates a meaning, evokes an emotional response: a set of distinctive feelings associated with it. In other words, we

do not necessarily sense the world as it really is but as we perceive it, as our past experience dictates.

- (b) ***All that we do is based on acts of meaning-making.*** If we do not make sense of the world around us, of the thing we call “reality”, then we cannot function, we literally cannot live. The inability to make some kind of sense of the world around us spells inevitable death. We do not need to construct a true representation of reality, just one that works for us and enables us to act.
- (c) ***The meanings that we create and live by are internal, individual and unknowable by others.*** We say that people share meanings between them, but in fact we cannot share the meanings in our heads: we are not telepaths. We can talk about them or use other semiotic systems to produce discourses about them, but they are entirely contained within each of us.
- (d) As we have no way of communicating (or sharing meanings) directly ***all attempts at communication (or “sharing meanings”) are mediated by semiotic or symbolic systems*** (language, gestures, drawings etc.) which we use in order to “communicate”. These attempts at getting our meanings across are constructed on the basis of our internal logical and representational systems i.e. how we ***organize knowledge*** and the world ***for ourselves*** and how we ***represent knowledge*** and the world ***to ourselves***.
- (e) ***Logical and representational systems are constructed through our interactions with our environment*** by our ***attempts to understand the world*** including “reality”, people’s actions or ideas ***in multiple ways***. They necessarily contain our operational histories, (world knowledge, strategies and much more, some of which is potentially undefinable or undescrivable). It is these operational histories which enable us to make sense of the

world. Because these operational histories are different for each of us, they make each of us understand the same phenomenon differently (otherwise we would all understand the same “thing” in the same way and there would never be any misunderstandings or confusion. We would never need to say things more than once as our utterances would be univocal and not prone to misunderstanding. Clearly, this does not happen). As a simple example, the same food smell can be delicious for one person or totally unpleasant for another. The same is true of abstract thoughts and language-based meanings. These operational histories necessarily also hold our entire functional personal knowledge and understandings and the things that we have learned: the operational sum total of our experience. They *enable* us to function by helping to organize or categorize the world and, at the same time, *limit* us to what is contained in the categories we create. They literally tell us what is relevant and what is not. Most of all, from a learning perspective, they account for the countless variables which distinguish us from one another and make each of us truly unique and experience specific learning needs.

Taken together, the above five principles tell us, in essence, that meaning/understanding is necessarily individual. Learning/teaching needs to respect this. Subjecting all learners to the same teaching/learning regime is not optimal. Another way of expressing this is to say that because of differences in personal history, learning needs must be different and, for optimal results, must be addressed differently. A pedagogic consequence of this, then, is how to elicit needs in order to meet them, especially as learners are often not aware of what they actually need (they may think that they know what they need, but they may be mistaken). Thankfully, there are both pedagogic and “natural” models for externalising needs. Both revolve around the same principle: creating a collision between the learner’s abilities/skills/knowledge (i.e. the learner’s

operational history) and specific tasks. As learners attempt to perform tasks they will discover their weaknesses or have them identified by others, and be able to seek help and support to deal with them. This is in keeping with the previously-mentioned 21<sup>st</sup> century notion of “just in time, just enough and just for me”: you deal with problems *as* and *when* and *if* you encounter them. It also has the serious logical consequence, especially for educational institutions, of requiring the abandonment of a fixed content-based or arbitrarily-sequenced curriculum, and its replacement with something like performance-based outcomes which would, of course, also have content but would be accessed and organised according to need rather than a one-size-fits-all approach.

Pedagogic settings for needs-elicitation, the heart of the above learning systems, could include such structures as long term simulations, for instance *macrosimulations* (Mestre & Lian, 1985) or other closed spaces/systems with a structured social organisation such as a radio station (Lian, A. B., et al., 2004), a company office, a university or even a family. These settings and accompanying activities provide an artificial but realistic 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 rejecting old understandings, refining them or replacing them with new ones. In this context, students obtain individualized feedback and move forward at their own pace according to their own requirements, ideally with appropriate support, and navigate along their own paths. Normally, such support would be provided either by learning institutions, if any were involved, or by shared online and other resources. Learners would traverse this space, solve their problems and, in a serendipitous fashion, discover new ones which they could then also proceed to solve. While we somewhat glibly state that “people would solve their problems” as if it were a simple matter, this is just a short-hand way of way of

addressing the issue. Clearly this is far from trivial and the subject of major research some of which is being built into the systems described above.

Importantly, not all learning spaces are pedagogic in nature (i.e. contrived for teaching purposes), not all learning needs to happen in a school or classroom. There may be better alternative spaces in the long run. Today's modern population of willing and able DIY "researchers" (described earlier) provides an equally powerful and perhaps more interesting learning space: real life. Attempts to complete tasks which, in turn, lead to the identification of needs, is what people actually do. It is the "natural" way of doing things. Like their counterparts in pedagogic settings, they too can discover their shortcomings, seek appropriate help, solve some problems and/or discover new ones. While they do not have a formal curriculum, they actually do have the equivalent of performance objectives or "jobs to be done" (Johnson, M. W. Christensen, C. M. and Kagermann, H., 2008)

In this perspective, the distance between pedagogic settings and real life effectively disappears. This is very much in keeping with the notion and principles of 21<sup>st</sup> Century pedagogy. It is also interesting to note that both settings are subject to the same conceptual and practical issues.

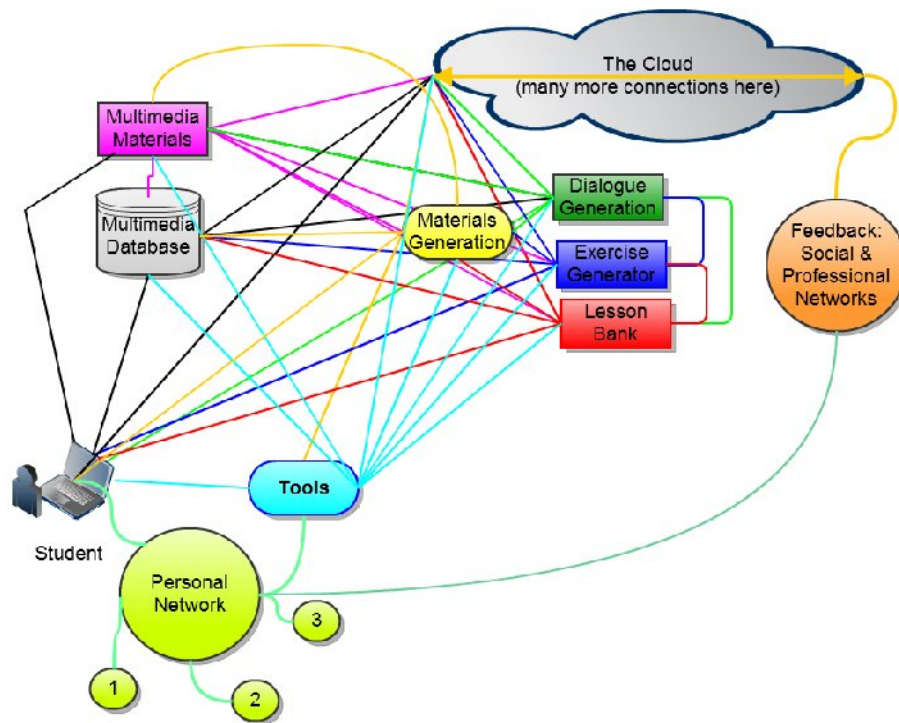
The conceptual issues are based on the following logic:

- (a) People identify a learning need and seek to solve it.
- (b) Learning needs depend entirely on one's personal operational history
- (c) Learning something means changing one's personal operational history (or, put otherwise, if you want to learn something, then change your history).
- (d) Changing one's history means altering one's logical and representational systems



- (e) Acting on a learner's logical and representational systems to achieve a specific goal cannot be applied uniformly to everybody (because each person's operational history requires different forms of intervention) and
- (f) Each person's actual learning path will almost certainly be different in some significant way from everyone else's. As a result, it should, most appropriately, be under the direct control, of the learner under the guidance but not the prescription of a teacher/mentor. In traditional curricular terms such an environment, with its unpredictable trajectory through content and other learning structures, may seem chaotic. Actually, it would simply be organized according to a different logic, that of learner need and preference, and would essentially be self-regulating, equilibrium being struck between learner, task and support systems (whether human or ICT-based) in the same spirit as Sugata Mitra's hole-in-the-wall experiments (e.g. Dolan, P., Leat, D., Mazzoli Smith, L., Mitra, S., Todd, L., & Wall, K., 2013).

From a practical perspective, in response to learning needs, we can envisage the creation of a Personal Learning Environment (PLE) for each learner whether participating in a formal course or not. The PLE would be based partly on need and partly on personal preferences and would be fixed neither in time, nor space nor form. It would be part human and part computer-based and all nodes/points in it could connect, potentially, to any other node/point. It might resemble the diagram below (a small network fragment taken from a hypothetical language/culture-learning system where every point shown is actually connected to every other).



*Fragment of a personal learning environment for foreign culture/language learning*

*The student (bottom left) is at the origin of the entire system.*

Human support can be found locally in either face-to-face mode (i. e. in person) or through computer-based communication, to reach friends, peers, teachers or even cloud-based social and professional networks. It is a natural path for students to seek support or answers from their defined personal learning network. Support can be sought from mentors, schoolmates, friends, family or experts in the academic spaces, social and professional spaces, virtual networks, forum sites or even chatrooms. Support can be sought as well from credible websites such as Youtube, Wikipedia, Askme; search engines such as Google or Yahoo; or specialized software tools and applications.

While human support may be location-specific and restricted in time, the technological support envisaged is ubiquitous, being based on permanently-connected networks (e.g. the Internet). These networks would provide not only communication facilities but also access to an advanced infrastructure consisting, *inter alia*, of information-rich multimedia databases with personalized front-ends (e.g. a database of linguistic and cultural events/information for learners of English), learner-generated exercises (e.g. learners actually create exercises based on issues that they wish to focus on (Lian, 2014)), specialized teaching/learning materials, learner-generated documents, specialized intervention systems such as listening comprehension systems (e.g. Lian, 1985; Cryle & Lian, 1985) with individualized feedback, sophisticated data manipulation tools (e.g. audio filters or concordancers) and other tools enabling activity (e.g. facilities for preparing multimedia presentations) (based on Lian, 2004, 2011, 2014). Also important, would be the provision of a decision support mechanism based (where known) on such variables as learner preferences, patterns of behavior and analysis of needs, perhaps drawing on learner analytics (e.g. Johnson, et al., 2013). This would provide learners with guidance beyond what they may be able to self-generate (from their PLEs and past experience). As pointed out above, a particularly important feature of this network is that every node in the network can connect to every other node in the network. No assumption is made as to the ways in which the network can be traversed and no sequencing of connections is imposed. Importantly, the computerized part of the network will contain many multimedia and other resources as well as activities, and will have the potential to grow as more and more material is added in response to learners' needs. Thus the system will keep increasing in size and complexity and, as a consequence, will be able to respond to the needs of more and more learners, wherever they may be.

A critically important component of this system, with its potential for quasi-infinite connections and no pre-determined sequencing, would be the raising of awarenesses (Lian, 1987). Awareness-raising is the first step in the reconstruction of personal operational histories as, without it, it would be essentially impossible to bring into the learner's field of relevance what had, until now, been irrelevant, i.e. unknown. The rich combination of networked people power and networked technological power supports awareness-raising and offers learners a form of triangulation (or verification) of perceptions and understandings through interaction with multiple discourses including personal observation, information, descriptions, explanations, opinions, modified or enhanced input, i.e. through enhanced rich multimodal input. This enables learners to maximize their chances of seeing things differently (Planck, n.d.), to begin modifying their histories, and, ultimately, to make a permanent change in their histories.

A short scenario will illustrate. A group of Thai-speaking learners of English need to understand how "Yes/No" questions work in English in the context of greetings. They get together both in person and virtually to discuss the issue, but they need further clarification. They query the computer network. The multimedia database returns a list of yes/no questions in their original "greeting" contexts e.g. movies, or interviews or other authentic interactions. Each instance is accompanied by relevant information and explanations (e.g. linguistic commentaries, cultural commentaries, even an analysis of gesture). Students observe these interactions and, in the light of available commentaries and their own experience, discuss how these yes-no questions seem to work and, then, they experiment with "what-if" scenarios. Because the media used are information-rich (rather than information-poor as in many "carefully constructed" textbooks), they also decide to study further instances of questions, specifically "information questions". Intrigued by what they discover, they decide to expand their search beyond questions

in “greeting” contexts and to examine how “greetings” work in general by scanning various online movies for examples of greetings in action. One particular movie attracts their attention and they decide to view it in its entirety. As they view the movie, they stop at various checkpoints to verify their understandings of the events of the film. They do so by responding to short comprehension questions built into the movie playback system.

Remembering their original purpose in interrogating the database, they request the system to generate individualized lessons for “yes/no questions in a greetings context”. They spend some time on these but still have unanswered questions. Three hours later, after some reflection, two of them write jointly to social and professional networks. Five hours later, they receive answers from their teacher, from a language expert who works on development of the system and from two native speakers (with whom they have been corresponding in English). Over time, other people, perhaps total strangers, interact with them and a collection of responses and information built on their query is constructed, indexed and published in the network.

The sequence just described can be summarized as follows. First, an arbitrary entry point was selected. In this case, it happened to be a specific question type, 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. Their chosen path was not pre-established but enabled by the database, the underlying communication network and associated pedagogic and non-pedagogic systems. Most of all, the students were able to have *their* questions dealt with efficiently and effectively in a rich and engaging way at a time and place which suited them, with a minimum of effort and a maximum of information or feedback. In the end, new nodes were added to the system to the benefit of *all* system users.

Such a system, by virtue of its structure and dynamic construction, is impossible to circumscribe or fix in time, space, or content as it (self-)adjusts to new circumstances. This makes it of particular relevance to the ASEAN context with its special richness in diversity of all kinds, a diversity which does not make it amenable to pre-regulation and artificial constraints. In particular, it can comfortably address

- (a) the considerable linguistic and cultural diversity of the ASEAN population,
- (b) the unpredictability of likely needs of that population, especially at times of great mobility,
- (c) the impossibility of having a fixed pedagogic structure responding to ALL of the needs of ALL of the people, and
- (d) the many developments in 21<sup>st</sup> Century educational and learning priorities as previously outlined.

This kind of educational system, which is adaptable in that it meets needs *as* and *when* and *if* they arise, and potentially connects any part of the system and its resources to any other part can be described as *rhizomatic* or *rhizomic* (based on the metaphor of the rhizome). The rhizome is a term originally derived from botany and adopted by postmodern thinkers Gilles Deleuze and Félix Guattari (1987). It is a metaphor used to represent a dynamic, open-ended, self-adjusting personal learning network constructed by the learners themselves to meet perceived and actual needs. Students navigate through nodes of knowledge representations or relevant challenges and, in turn, construct personal knowledge organically rather than according to some arbitrarily predetermined external pedagogic sequence such as a curriculum mandated by an authority structure such as school or government.

Thus, the system described in this paper can properly be categorized as rhizomatic (or rhizomic), supporting the development of Personal Learning Environments which, in turn, depend on the constant generation, and re-generation of dynamic Personal Learning Networks (i.e. unpredicted, unpredictable, potentially infinite connections to and from knowledge representations and relevant activities).

While research into rhizomatic systems is still in its infancy, the authors have been active in the field for some time (Pineda (2011, 2012) for rhizomatic PLEs in the Philippines and Lian (2004, 2011, 2014) for theoretical descriptions and small implementations of rhizomatic models for culture and language learning). The PLE and rhizomatic movement is now beginning to attract interest in the US, Europe and Asia, not only in terms of language and culture study but in other areas of learning as well. The model described here is currently being investigated further by a team of international researchers drawn from five countries (the Philippines, Thailand, Vietnam, China and Sweden). Areas to be covered include professional service workforces, collaborative teaching/learning networks, citizen participation in communities, culture studies, language studies, mathematics studies, science studies and work-integrated learning. These studies, both intellectual and data-driven will serve as a springboard for the development of the kinds of model described in this paper as well as offer a testing ground for systems already developed.

In this paper we have focused on our perceptions of the needs of the highly diverse ASEAN community. In order to meet the challenges set we have sought to explore and lay down the basis for a general learning theory and learning system responsive to both diversity and need. In so doing, it is hoped that the rhizomatically-based PLE system described here will help to determine solutions to learning problems of a general nature and not just ASEAN-specific

problems. It is intended that it will help produce clearer theoretical formulations of how humans learn and of how they can best be supported in this pivotal undertaking in what is undoubtedly the most intellectually and socially challenging century yet.



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