Socioculture and Cognitivist Perspectives on Language and Communication Barriers in Learning

David Hallberg

***Abstract*—**It is believed that major account on language diversity must be taken in learning, and especially in learning using ICT. This paper's objective is to exhibit language and communication barriers in learning, to approach the topic from socioculture and cognitivist perspectives, and to give exploratory solutions of handling such barriers. The review is mainly conducted by approaching the journal *Computers & Education*, but also an initially broad search was conducted. The results show that not much attention is paid on language and communication barriers in an immediate relation to learning using ICT. The results shows, inter alia, that language and communication barriers are caused because of not enough account is taken on both the individual's background and the technology.

***Keywords*—**communication barriers, cognitive, ICT, language barriers, learning, socioculture

I. INTRODUCTION: LEARNING DIVERSITY

SOCIAL institutions change [1], education and teaching devices in education change [1-2], and the learners change [3]. No matter if it is a specific learning situation or other situations and circumstances, everything changes, which is an inevitable part of the reality [4].

The role of individual diversity in learning is a present concern. One reason being classrooms filled with more learners that are non-traditional. Technology in learning is often perceived as a harbinger of educational change [1] and the rise of technology in learning situations may provide some solutions "but first the nature and scope of useful differences needs to be identified." [3]

The physical boundaries of learning environments decrease. This means, formal learning may be offered to learners from everywhere, at any place and time, and in cross-border settings. Learners may even collaborate jointly, no matter what their social background, for instance in terms of language diversity, happens to be.

Teaching persons from different social groups are rooted, more or less, forty-five years back in time [1]. Nevertheless, there still seems to be a lack of research on language barriers in learning. One possible reason to the lack of research on social class differences in American education might be that Americans tend to think of their society as 'classless', or that they all are 'members of the middle class' [1]. If so, it is reasonable to assume that similar thoughts exist in other parts of the world. If everyone is assumed to belong to the same social class, this may be a reason why not much attention is paid to language barriers since 'social class' and 'language' have a certain connection. It is also declared that the learner's social background influences the ways in which the learner employ his/her own language in learning [5-7].

The topic of this paper is language and communication barriers in learning using information and communication technology (ICT).

A. Stand points

This paper is set out assuming the following:

- Every one should have equal opportunity to learning irregardless of social status/standing, language and background.
- It is necessary to learn, i.e. gain knowledge (e.g. literacy skills), to become empowered, and thereby become members of the society including the world, as a whole.
- Learning is a process of living [8]
- There is no such objective truth, just subjective experiences of phenomena around and inside us [9].

B. Definition of language barrier

For the purpose of the present paper, *language barrier* is a kind of psychological barrier in which language is a *psychological tool* [10] that affects the communication being put across.

C. Justifications for writing the paper

Justifications for writing this paper are:

- The learners are becoming more diverse
- The usages of digital physical tools in learning are increasing, and
    - these tools are believed to be a culture of its own [11-12].
    - these tools can bear political qualities [13].
- There seems to be little research on language and communication barriers in an immediate relation to learning by means of ICT.
- Learning supported by ICT in virtual environments is gaining increasing currency and popularity in general.

D. Knowledge contribution

The present paper contributes to the field of language and communication barriers (excluding computational language) in learning using ICT. This paper is useful for persons

David Hallberg is with the Dept. of Computer and Systems Sciences, a joint venture of Stockholm University and KTH, Forum 100, SE-164 40 Kista, Sweden | Phone: +46 8 16 20 00 (e-mail: dhallb[at]kth.se).

interested in learning and education supported by ICT, and on individual and language diversities.

II. Method and procedure

One major problem in doing this research would be related to the two terms of low and high scatter fields. *Low scatter fields are* where "the underlying principles are well developed, the literature is well organized, and the width of the subject area is fairly well defined". *High scatter fields are* those in which the organization of the literature is, more or less, nonexistent [14]. This field of research in belonging to high scatter fields makes it more difficult to cover all prior research on the topic.

This paper can be employed as a guideline in empirical studies. The author's intention is thus to do so in a project comprising about empowering women with literacy skills through ICT, by mapping out the language and communication barriers experienced by the women in the sudy.

In doing this review, the journal *Computers & Education* was chosen. Elsevier explains their journal in terms of computing and communication technology making an increasing impact on all aspects of cognition, education and training in many contexts. The journal is a technically based, interdisciplinary forum for communication in the use of all forms of computing in this socially and technologically area of application. Welcomed are papers on cognition, educational or training systems development using techniques from and applications in any technical knowledge domain [15]. Reading through the literature retrieved from Computers & Education shows that little research has been conducted on language and communication barriers that focus on natural language jointly with ICT usages.

Hrastinski in his research on participation relative to learning by means of ICT:s reported disadvantages with approaching from one journal only in conducting a literature review. This way of conducting a review will not represent a broad stream of journals within the topic. On the other hand, the review will be more focused, Hrastinski claims in referring to prior studies [16].

To be included in this review, papers had to discuss communication and language barriers in relation to formal, natural language (i.e. not computational language).

A. Prior research on language and communication barriers

A broad search was conducted throughout university libraries' databases and Internet to illuminate prior research on the topic. By doing so, it was possible to find out broad tendencies. For instance, researchers in approaching the topic tend to focus on the field of health care, investigating the contact between staff and patient, and not very often in an immediate focus upon learning by means of ICT.

B. Query-structure search

In doing the review, the following query structure was conducted to identify articles in the journal *Computers & Education*:

- "communication barrier OR language barrier"

The query resulted in 11 hits (September 2009) (see appendix).

Employing "language barriers" restricted to TITLE or KEYWORDS resulted in 1 hit.

This hit is a book review on Yazdani's (ed.) *Multilingual Multimedia Bridging the Language Barrier with Intelligent Systems*. The reviewer of the book means that the book has a lot to offer for those interested in the development of computerized tools for language support [17].

C. Distribution of the three learning perspectives

It is accepted that, to discuss learning deeper consideration must be taken on ways in which learning occurs. Query structures were conducted in Computers & Education to identify the distribution of the three perspectives of *socioculture*, *cognitivist* (including *Piaget*), and *pragmatist* throughout Computers & Education to look upon general tendencies:

Sociocultural

- sociocultur* OR socio-cultur*
- sociocultur* OR socio-cultur* OR vygotsk*

Cognitive

- cognitiv*
- cognitiv* AND piaget

pragmatism

- pragmatis*
- pragmatis* OR dewey OR mead

This resulted in 115 hits for sociocultural and 116 including Vygotsky; 968 hits for cognitivism, 975 including Piaget; 13 hits for pragmatism, 39 including Dewey, and 55 including also Mead (June – September 2009). The result also shows that Vygotsky is the obvious person to refer in the context of education and ICT from a sociocultural perspective in the journal Computer & Education.

To combine the topic with each learning perspective, the following query was performed:

Sociocultural

- ALL(sociocultur* OR socio-cultur* OR vygotsk*) AND ("communication barrier" OR "language barrier") AND SRCTITLE(Computers & Education)

Cognitive

- ALL(cognitiv* OR piaget) AND ("communication barrier" OR "language barrier") AND SRCTITLE(Computers & Education)

Pragmatism

- ALL(pragmatis* OR dewey OR mead) AND ("communication barrier" OR "language barrier") AND SRCTITLE(Computers & Education) AND "language barrier"

These three latter queries resulted in 3 hits for sociocultural, 1 for cognitivist, and none for pragmatist. Thus, it follows the

tendency of the result of the first query (see table I).

III. Related work on language and communication barriers

TABLE I
DISTRIBUTION OF LEARNING PERSPECTIVES IN *COMPUTERS & EDUCATIONS*

Perspective	Number of papers	Arguments
Sociocultural	115	Learning/gaining knowledge through collaboration
Socioculturalincl Vygotsky	116	NN papers make use of Vygotsky's XX
Cognitivist	968	The instruments employed to learn/acquirier knowledge
Cognitivist incl. Piaget	975	The stages/process of learning
Pragmatist	13	Philosophy of education, democratisation and participation
Pragmatist incl. Dewey	39	
Pragmatist incl. Dewey & Mead	55	

Before entering the journal Computers & Education, an extensive search of published literature throughout several databases (e.g. ERIC, Goggle Scholar, Science Direct, SpringerLink,) was conducted to identify prior research on language and communication barriers. From this search, the following was suggested:

Communication barriers in terms of natural language in learning may occur when learners' conceptions are not taken into account [18]. Because of this, it may be of concern in understanding the difficulties learners might have. An example of this is a communication barrier that occurs because of learners' lack of hearing [19] is not taken into account in designing the learning situation. That is, the information and communication technologies (ICT's) employed in teaching may be designed in a way that gives rise to such a communication barrier.

Different school subjects and learning in different countries mean different barriers. One major concern in learning mathematics among coloured learners in South Africa is the language barrier. The reason is that the learners "are taught in their mother-tongue until Grade 7 only to switch to English in Grade 8" [4]. In order for learners to concentrate on the given task and understand the subject, "they have to cross the language barrier first." [4] Similar concerns are raised not only in other parts of Africa. For instance, in several of the countries in Latin America (e.g. Uruguay, Bolivia, Ecuador, Peru, and Guatemala), a large proportion of the population employ a language as their L1 is not the official or national language in the country.

In a study in South Korea on communication barriers perceived by older (>60) hospitalized patients and nurses, Park and Song identify, supported by prior research, three elements of communication barriers in hospitals: "the nurse, the patient, and the hospital environment." [20] In a learning situation, it would be reasonable to talk about the 'teacher', the 'learner', and the 'learning environment'. Into the learning environment is included the learner and teacher's environment (e.g. social and cultural environment). Park and Song's paper brings up a case in which staff and patient share geographical location. This need not be the case, however, in a learning situation. A learning situation may be conducted at a distance on stationary computers through social communities or portals [16] (e.g. Fronter, Blackboard) or mobility on mobile phones. In both these cases, it would not be enough just to talk about Park and Song's three factors, since a physical separation from teacher and other learners may be a reason for communication barriers [21]. Park and Song also suggest that a study on communication barriers should be carried out from at least two perspectives that would be from, the patient's/learner's and the nurse's/teacher's perspectives, respectively.

Communication barriers in terms of language do not need to be a concern through the entire learning situation. Chen and Liu suggest that Taiwan students in China, whose L1 is not Chinese, mostly experience concerns with learning and communicating the first year of their study [22]. Bearing these results in mind, greater emphasis on language diversities must be made starting when the learners initiate the learning situation to be less emphasized in later stages. To solve the concern with earlier language barriers among Taiwanese learners, Chen and Liu's paper improves a developed Web-based Synchronized Multimedia Lecture (WSML) further. The system follows the Computer-Assisted Language Learning (CALL) philosophy. The advantages with this system are 1) Dynamic media presentations of lectures can increase students' learning efficacy, 2) Online self-assessment tools can measure students' performance, and 3) Useful course management systems can facilitate teachers to create their own courseware and questions for Web-based instruction. Three teachers were consulted to give their comments on the web-based system. They meant, the recording function is helpful for teachers to prepare materials for different language learning goals, but it is a little unstable when uploading lectures. The management tools are good for managing online courses and self-assessment questions, but the operations are complex (i.e. it is not user-friendly [22]

De Voggd in his paper on participation in educational settings supported by ICT argues that using [digital] technology in learning, as a device for constructing knowledge is fruitful in a context in which learners could improve their pre-knowledge of language. An obstacle in current methods, integrated learning systems and software, is that they do not always allow the learner to include their own language or participation style in new learning activities. Moreover, learners from different cultures participate in different ways. Therefore, both cultural and language concerns should be taken into account in learning situations together with others [23].

Over all, prior studies on language and communication barriers are most frequent in the area of health care. Nevertheless, including some of these articles would be

fruitful since, for instance, they deal with communication between human beings (i.e. staff and patients) [24] and health and social care consultations between human beings [25]. In studying this research from a health care perspective, many similarities with learning situations arise. Flores, for example, exhibits education to decrease language barriers in connection with paediatric burns [26].. Towle et al goes into education to increase the quality of doctor—patient communications in the Aboriginal community [27]. Polednak found that Hispanics in United States are achieving poorer health care treatment because of language barriers. For the same reason this group risks receiving poorer education. Even though it is important to overcome communication barriers in health care, these barriers still exist as they do in learning situations [28].

Although teachers and learners are rooted in different social groups, there is still a lack of research on language and communication barriers in learning. A major concern with communication is that even though the spoken language and gestures are fundamental for representing human communication, normally, communication is upheld and maintained with low awareness [29]. Not being aware of how to communicate, might result in an asymmetrical relationship between actors in a negative sense [30]. This lack of awareness would make the communication barriers deeper and more difficult to manage.

This overview of related work to some degree has illuminated "what causes communication and language barriers?" A major concern with prior research is the lack of research on such barriers from a more immediate learning perspective.

Ogbu refers in his paper on minority education to other researchers meaning that the educational problems in schools could be genetic or because of learner's socioeconomic status, but they could also be a result of language differences. Ogbu also shows that the reasons for coming to a country may be a factor for the learning process. Immigrant minorities (people who moved more or less voluntarily) are more likely to succeed than involuntary minorities (brought into another society through e.g. slavery, conquest, or colonization)[31].

IV. Papers on Language and Communication Barriers in the Journal Computers & Education

Eight papers were found on language barriers in the journal Computers & Education whereof one is a book review, each of them categorized in appendix.

Besides Govender, the review shows that focus is not directly put on *personal experiences* of language or communication barriers.

- Govender's study was conducted in a class learning programming. One of the participants expressed that for him a person with bad command in English trying to explain decreases the probability to understand the concepts [32].

Rather, focus is put on causes of language and communication barriers, as the researcher in doing the study perceives them (in listening to the participants) and not through quotations or similar.

- The barriers outlined occur because the teacher teaches in a language that is not L1 for all the learners [4].
- Dr. Carolina was professionally trained in communication skills, and appeared to be a good listener. She indicated that she encouraged her students to speak up in class, and listened intently to what they had to say. She reported that she was tactful in managing these foreign students to overcome the language barrier. [33].
- To overcome [not native student's] language barrier in National Chi Nan University (NCNU), a Web-based Chinese classroom (http://chinese.csie.ncnu.edu.tw) exploiting advanced Web and multimedia technologies has been initiated since 2002 [22].
- One of the major problems in learning mathematics is the language barrier. Pupils are taught in their mother-tongue until Grade 7 only to switch to English in Grade 8 [4].

The major effects of language and communication barriers are problems in understanding and concentrating, but also decreased motivation, and a sense of exclusion.

- In many cases science learning difficulties occur because students' conceptions are not taken into account, and therefore communication barriers between teachers and learners may not be overcome [18].

Language and communication barriers would be tackled by implementing new technology along with making teaching that mirages the "real" world better or by combining technology by traditional methods.

- Writing letters to "real" children helped put the technology into the psychological background for the email users. When computer-anxious users and computer illiterates became involved in their "real" email experience they found that the frustrations and negative expectations of confronting the technology were superseded by the joys of the positive experiences [19].
- Teaching and learning of concepts related to chemical bonding can be improved by using CAI [18].

V. Exploratory Ways of Handling the Barriers from Two Learning Perspectives

It is believed that a learning perspective must meet with many aspects. It is not the intention to mention all these aspects, but just a few to demonstrate some of the beliefs (see table II).

Three major perspectives in learning theory and research are socioculture, cognitive, and pragmatism.

The research from the sociocultural perspective often is

grounded in Lev Vygotsky's theories and emphasizes learning through collaboration. Vygotsky (1896-1934) accentuates the importance of social interaction to learn, for instance, to develop a language. However, as Piaget claimed, Vygotsky insisted that there are cognitive tools; but still there are the social interactions that compel us to development. Vygotsky made changes in his explanatory principle, and there are three main phases [34]. During the 1920s Vygotsky focused on a unit of activity mediated by signs used as tools or instruments to control behaviour. During this epoch, he claimed that the stimulus-response unit provides the common foundation for learning. After 1930, he shifted focus and talked about physiological systems (analytic unit) in which the focus also should be put on the development of new relationships between mental functions. After 1932 a third phase came in which he emphasized a system of psychological constructs that would simplify the analysis of psychological processes about the concrete interactions [34]. With his concept of 'internalization', Vygotsky means that development is not a process that can be conducted alone, but development occurs in direct or indirect relation with others [35].

TABLE II
EXAMPLE OF LEARNING PERSPECTIVES' ASPECTS

Author	Year	Suggestion
Davis & Dykman	2008	The role of the teacher
Schwartz	2008	The role of and the regard on ICT:s
Hrastinski	2009	Participation
Jeffery	2008	Individual diversities
deVoogd	1998	Cultural and language diversities
Winner	1986	Political concerns

The research that approaches from a cognitive perspective often emphasizes 'skill', 'style', 'tool', and 'development'. The articles founded in Computer & Education that draw from a cognitive perspective do not draw from a particular theorist. Two examples of theorists or researchers in this respect are Rand Spiro and Boicho Kokinov. Spiro is known for his cognitive flexibility theory that deals with knowledge and experiences in terms of teaching and learning. Kokinov is known for his cognitive modelling and architecture. Cognitive science focuses on how the mind works with computational modelling of proposed mental processes in relation to what is known about how people use knowledge in everyday settings. From Sawyer's book it is found that, central to this science is the notion that intelligent behaviour is based on representations in the mind. Around 1990, cognitive science became central in the learning sciences [36].

A. Sociocultural perspective

If the goal is to have education for everyone, there might be concerns since the teacher must make allowances for learners' different ways of understanding the learning objectives. A solution for this concern is to collaborate.

Hmelo-Silver illustrates this by exemplifying "the three blind men and the elephant from the Indian parable that describes their observations, each from their own point of view."[37] This parable conveys the advantage of collaborating on the same task in order for the learners to reach a solution. Collaborating in this sense would be a way to understand one another's social background that influence the language and understanding of languages and at same time learn what is meant to be learnt. One learner, no matter his background, perceives just only "a small portion of the whole beast", but in collaboration with others, he will come to have "multiple methods" from which he can choose in order for him to understand [37].

Another side of collaboration is through intersubjectivity. This term can be explained as knowing the world through the perspective of at least another member of the world. This claim becomes clearer in regarding ''I'' and ''You'' as "two aspects of the same phenomena."[38] In the long run, this will lead to the creation of an intersubjective space where meanings do not belong to one person only, but are shared. If so, there must be an answer to how learners with different language background have possibilities to share their world with one another in a concrete learning situation. Since different languages have different terms and concepts, and the speakers employ the same world in different ways and in different situations, there must be different worlds on at least two levels; one at a linguistic level and another because we are individuals. Furthermore, it would be difficult to reach this other world in terms of intersubjectivetly if one learner does not understand fully the L1 language of another learner. Thus, there can hardly be any shared world between them if they experience linguistic barriers.

If the behaviour differs because of social differences, it would be harder to learn and the learning process will be slower having the teaching language as L2. This is the case for many learners in the northern parts of South America. In most of these countries, the official language is Spanish. Nonetheless, many citizens have other languages as their L1. Of these, a majority are poor and live in the rural areas [39]. This problem becomes even more apparent in referring to a group of people that are close to both the culture and language, but despite that are discriminated. People from Colombia are close to Spain in terms of language and historical bonds. Despite that Zlobina's et al study on sociocultural adjustment of immigrants in Spain shows that this group reported the same degree of discrimination as the immigrants from Sub-Saharan Africa [40]. Consequently, if the group that has a similar background may experience discrimination and problems in assimilating the education, this would worse for learners of other marginalized groups that also have another language added to the official; and maybe to a large degree. That is, in considering "every learner" consideration must be taken on all groups, irrespectively to which social or language group they belong. Having the same background in one way or another does not automatically mean an ability to cope with same pedagogy. We might anyhow feel different.

Thurston's paper reports that peer tutoring between non-native speakers and native speakers might be characterized by native speaker's taking longer turn lengths in conversations and being more directional and less suggestive in their tutoring styles [41]. If so, in learning where the learners use the same language but some of them have the teaching language as their L2, it would be more difficult for this marginalized group of learners than for the other group to cope with the lecture.

Lin and Zini work for Linux and their paper describes the potential that computers have for collaborative learning and for being an aid for specific subjects, for instance for languages learning and understanding [42]. Their paper shows that there are open source technologies that easily can be tailored for different languages. Much of the development process for these programs and applications is in the hand of the users, they state in their paper. A risk of thinking as they do in their paper is that the people that could be helped by such computer programs might feel they need to overcome another barrier first. They must not only come to understand how to work with a digital device (e.g. computer, mobile phone), but also to customize the program to understand what they need from it. Prior research shows that learners having parents without any experience of ICT or education in Latin America are the poorest one. They are also the citizens that often have another language than the official one as L1. In addition, these learners find it most difficult to attend learning situations at all. To let the technology be in their hands may not be an easy task since these kinds of learners might feel that there is another barrier to cross before starting to learn. Instead, the learning and teaching devices (hereafter referred to as education devices) should be tailored in advanced.

Using software in a computer to communicate implies embracing language and other symbolic systems through the usage of this cultural physical artefact [43]. Using such a digital culture in collaboration with others, the learner's and teacher's awareness of themselves and others may increase. Combining the potential computers have to enhance the communication with others with the computers' potential to play a role in the process of learning a L2 [44] makes it possible to design a learning situation that makes allowance for learners' language backgrounds. Communicational approaches emphasize the social aspects of language acquisition and the arrival of the medium of Internet facilitates language learning. Even though computers have been used in L2 teaching for more than two decades as exemplifying good teaching, the majority language teachers still have not recognized them.

Another language barrier may be expressed as learners having different ways of constructing knowledge jointly with others. Darrell M. Hull and Terrill F. Saxon's paper notes this in the context of online learning. In their paper, they refer to online learning as "having more than 80% of the content delivered using a web-based format, and there are no face-to-face meetings" [45]. They state in their paper, an advantage with taking an online approach when it becomes asynchronous is that the approach allows the learners to be reflective because of the temporal extension of human dialogue. Thus, an online approach to education may extend the learners' time for consideration so they do not feel stressed to give a fast reply. This is a reason why communication "online can be enhanced between speakers/listeners…"

B. Cognitive perspective

A major goal in learning situations is to develop learners' "higher-order thinking skills" including synthesizing information, solving problems, combining facts, generalizing, hypothesizing, and arriving at logical conclusions [46]. Prior research reports difficulties with arriving at these goals if the learning situation is not held in learners' L1 and that CALL systems may provide some solution to this language barrier. However, Barak also stresses the ambiguity of the concepts of ''Educational Technology'' and ''Technology Education'' and that not all schools are aware of how a technology employment would be realized in order to maximize the learning and teaching processes[46]. To solve some of these concerns, included into learning situations that employ technology must be design, problem solving, robotics, control systems, and issues related to communication systems. Systems that are to be employed in learning must therefore realize learner's aspirations as Barak claims in his paper referring to prior research. Considering these factors, technology may present an opportunity to confront real-world complexities and to work collaboratively [46]. In these real-world complexities there are communication barriers, and in this collaborative work, language barriers might be found. To solve these matters the concept of cognitive tools may be helpful. The goals for cognitive tools are to support the cognitive process of learners, and that is fruitful if these tools can meet the diverse needs of learners [47].

Cognitive style focuses on the individual's "typical modes of perceiving, thinking, remembering, and problem solving." [48] In relying on cognitive style in learning situations, language barriers would decrease if the L1 of the learner, through which the learner perceives the world, were accounted. This is important since not all learners learn the same things in the same ways and not every learner is capable of developing their learning paths by themselves. Thus, cognitive style would influence in that it accounts on individual's differentiation in responding and functioning in different situations including "attitudes, choices, and habitual strategies related to an individual's style of perceiving" and thinking [48].

A way of coming to understand language barriers is to map them out. Concept maps may be used in educational psychology "to achieve an explicit representation of what a learner knows about a specific topic [49]. In mapping the learner's thoughts around a particularly topic or concern, it would be possible to manage some of the barriers related to language among learners and teachers, and between one another. Coffey in his paper employs concept maps to designate precedence relationships among the concepts[49].

Employing a concept map in that sense would make it possible to have the learners and teachers map out certain parts of a learning situation. In so doing, the answers given from such a mapping would be related to individual factors, for instance, to individual diversities because of individual differences in language skills.

An understanding of diversities caused by differences in language usage may be achieved by studying the errors all actors involved in learning situations make. Kay develops "a system for classifying errors made while learning a new computer software package." [50] In so doing, he counts on gender, age, education, and level of computer proficiency. The study was conducted as survey, interviews, and learning the spreadsheet software package used to create, manipulate, and present rows and columns of data as the main task. The focus was to examine the role of errors with respect to learning computer software [50]. As for the steps, the subjects for the study were asked to think aloud while working on the tasks. The results show that every subject, in average, produced 17.4 errors for the 55-minute learning period. "Errors were experienced most often when subjects were seeking information [and] processing knowledge" [50]. A learning situation is very much built upon information seeking and knowledge processing, and prior research show evidence for that learners with another L1 than the employed one by the teacher may find it harder to seek information using ICT and process knowledge through the teachers teaching. A similar study as in that Kay made [50] but with a sample based on social and language background, that is, in which subject's L1 and L2 are noted, would therefore be worthwhile in order to identify different behaviours and results in seeking information on computers in education.

C. Lack of pragmatist perspective

Not much research in this field seems to use pragmatism. A notion for such a perspective would be to focus on controlling the barriers through participation and enhance learning through inquiry. For some decades, pragmatism was regarded as an outdated movement and lot of pragmatist work has not been put into practice [51]. Searching through prior research within learning and education will call to understand that such an approach is quite unusual in learning that is supported by information and communication technologies (ICTs). John Dewey was an educational reformer who analyzes those systems in which the participants act. He does it from the individual's viewpoint. He uses his theories to propose the importance's of being active while learning and not only relying on pre-written words from books. His context is found in the educational system, against which he directs sharp criticism.

VI. CONCLUDING REMARKS

This paper stresses two major types of communication barriers.

1. Language barriers that are caused because of
    a. general diverse social backgrounds
    b. diverse language backgrounds

Language barriers may lead to decrease motivation and slower learning ability.

2. General communication barriers are caused by geographic dispersion and difficulties with handling the technology, no matter the geographical distance.

The claim made here is that, language and communication barriers to a major degree are caused by too little account on both the individual and the technology in learning by means of ICT.

Not much literature focuses on experiences of language and communication barriers on an immediate individual or personal level.

This paper also suggests that language and communication barriers very often should be dealt with jointly because of their reciprocal appeal.

Three ways to manage language barriers are to

- design the teaching devices in a way that make available language switching and translation of keywords.
- collaborate over the tasks that were given by the teacher. In so doing, the learners may come to understand the social background of one another.
- let the learners map out their thoughts.

In addition, some articles (not outlined in the foregoing section) call for a social cognitive/sociocognitive perspective[1]

VII. REFLECTIONS ON ICT, DIVERSITIES, AND LANGUAGE BARRIERS

Many of articles use in this paper express a positive belief in ICT. Nevertheless, the role of the teacher, the pedagogy itself, and the way in which we choose to employ the devices must not be forgotten in order to decrease language barriers. Teaching is a dynamic transaction between mind, materials, outcomes, and goals within a complex cognitive and socio-cultural environment. Because of the inability of how to implement digital devices in the classroom, there remains a major contemporary problem with the usage of such devices in education [52].

To the New York Times [53] M Vanderhoek, a former middle school teacher, said "I would much rather put a phenomenal, great teacher in a field with 30 kids and nothing else than take the mediocre teacher and give them half the number of students and give them all the technology in the world.".

McVay et al in their paper state, "Technology alone will not improve learning. It is the way we choose to employ the tool that will make the difference." [54]

Given this, we would not be able to break down language barriers only by means of ICT. We must also understand the

[1] The sociocognitive perspective focuses mainly on adoption of a technology (Shih 2008), exploration the role of feedback and behaviour (Wang & Wu 2008), outcome expectations in terms of collaborative learning (Hsu et al 2007), and personal behaviour in using a device and learning something in a collaborative mode (Nussbaum (2009),

ICT and position the pedagogy thereafter.

APPENDIX

A. Language barriers

1) Foci in relevance
- Computer aided methods [55]
- Hierarchical data structure for school usage [56]
- Problem solving programs [4]
- Online course resources usages [33]
- Web-based language instruction system [22]
- Influence of learning context while learning to program [32]
- Carers' engagement in their children's' learning [57]

2) Seminal perspective/work in approaching the topic
- CAI/CAL [4, 55-56]
- Success of resources [33]
- Language learning system (e.g. CALL) [22]
- Activity theory [32]
- The role of technology in learning [57]
- Carers role in children's learning [57]

3) Method/design
- Empirical/case study[32-33, 56]
- Empirical/experimentation [4]
- System overview [22]
- Empirical/project study[55, 57]

4) Learning perspective
- Not expressed [4, 22, 55-56]
- Socioculture [32, 57]
- Social constructivist [33]

5) Learning subject taught
- Economics [56]
- Language [22, 33]
- Mathematics [4, 55]
- MBA [33]
- Nutrition [56]
- Physics [55]
- Programming [32]
- Technology to support carers involvement in school education [57]

6) Individual/group experiences of language barriers
- Not expressed [4, 22, 33, 55-57]
- "…highlighted for me is the language barrier. One student was speaking in slightly broken English. I was trying to understand him" [32]

7) Causes of language barriers
- Computer program documentation not translated [55]
- Information available in an languages that the user does not understand [56]
- Students/teachers not using the same L1 work together [32]
- Subject not being taught in learner's L1 [4, 22, 33]
- Software/interface [4, 22, 33]
- Carers lack of ICT skill in comparison to their children's ICT usage [57]

8) Effects of language barriers
- More difficult having a cooperation between different countries [55]
- Decrease information retrieval [56]
- Decreased motivation [33]
- Decreased communication among students [22, 33]
- Constraint in learning, understanding, and concentration [4, 22, 32]
- Constraint in understanding children's ICT usages [57]

9) Views/Ways of tackling language barriers
- Translating the text [55]
- Using viewdata as information retrieval service [56]
- Using instructor with L1 command in the particular language [32]
- Speaking up in class [33]
- Web based instruction environment [22]
- Carers involving in children's ICT usages [57]
- Carefully designed ICT [4, 57]

B. Papers on Communication barriers

Three papers on language barriers were found in the journal Computers & Education, each of them categorized below

1) Foci in relevance
- Adult technology adoption [19]
- Influence of computer-assisted instruction on students' learning [18]
- Collaborative learning [21]

2) Seminal perspective/work in approaching the topic
- Computer literacy [19]
- (Computer) anxiety [19]
- CAI [18]
- Collaborative learning [21]
- Distance learning/education [21]

3) Method/design
- Empirical/phenomenographic [19]
- Empirical/experimental [18]
- Empirical/case study [21]

4) Learning perspective
- Not expressed [18]
- Metacognitive [19]
- Socioculture [21]

5) Learning subject taught
- Teacher-librarianship [19]
- Chemistry [18]
- HIV/AIDS prevention [21]

6) Individual/group experiences of communication barriers
- Not expressed [18-19, 21]

7) Causes of communication barriers
- Depravedness of available information [19]
- Student's conceptions are not taken into account [18]

- Lack of account on both synchronous and asynchrony approach [21]

8) Effects of communication barriers

- Sensation of exclusion [19]
- Difficult to learn [18]
- Unbalanced course components [21]

9) Views/Ways of tackling communication barriers

- Implementing new (reading) technology [19]
- Synchronous and asynchrony CMC tools usages [21]
- CAI usages in integrating it whit other teaching metohds [18]

ACKNOWLEDGEMENT

David Hallberg thanks Associate Professor Jörgen Lindh for his engagement, inspiration, and for having broadened his knowledge on ICT, IS, and (e-/networked-) learning in general. He also thanks Lecture Carol-Ann Soames for fruitful advices.

REFERENCES

[1] Kerr, S.T., Toward a Sociology of Educational Technology, in Handbook of research on educational communications and technology, M. Spector, Editor. 2003, University of Washington: Washington.
[2] Svedberg, S., Jörgen Lindh, Ett lärande arbetssätt med datorstöd. 2009: www.vulkan.se.
[3] Jeffrey, L.M., Learning orientations: Diversity in higher education. Learning and Individual Differences, 2009. 19: p. 195–208
[4] Maredi, M., H. J. Oosthuizen, A Problem-Solving Cai—Facotr-Q. Computers & Education, 1995. 25(4): p. 235-250
[5] Bernstein, B., Language and Social Class. The British Journal of Sociology, 1960. 11(3): p. 271-276.
[6] Bernstein, B., Class, Codes and Control. Volume 1: Theoretical Studies Towards a Sociology of Language. 1971, Boston: Routledge & Kegan Paul.
[7] Lawton, D., Social Class Language and Education. 1998: Routledge.
[8] Dewey, J., My Pedagogic Creed. School Journal 1897. 54: p. 77-80.
[9] Marton, F., Phenomenography — Describing conceptions of the world around us Instructional Science, 1981. 10(2): p. 1573-1952.
[10] Vygostky, L., Mind in Society: Development of Higher Psychological Processes, ed. M. Cole, Vera John-Steiner, Sylvia Scribner, and Ellen Souberman. 1978, Cambridge: MA: Harvard University Press.
[11] Wilson, S.M., Leighton C. Peterson, The Anthropology of Online Communities. Annu. Rev. Anthropol, 2002. 31: p. 449–467
[12] Berg, I., Meaning in the making: The potter's wheel at Phylakopi, Melos (Greece). Journal of Anthropological Archaeology, 2007. 26: p. 234–252.
[13] Winner, L., Do Artifacts have Politics?, in The whale and the reactor: a search for limits in an age of high technology, L. Winner, Editor. 1986, University of Chicago Press: Chicago. p. 19-39.
[14] Mote, L.J.B., Reasons for the variations in the information needs of scientists. Journal of Documentation, 1962. 18(4): p. 169-175.
[15] Heller, R.S., C-C. Tsai, and J. Underwood. Computers & Education - Elsevier. 2009; Available from: http://www.elsevier.com/wps/find/journaldescription.cws_home/347/description#description.
[16] Hrastinski, S., What is online learner participation? A literature review. Computers & Education, 2008. 51: p. 1755–1765.
[17] Gardner, D., Book Reviews: Multilingual Multimedia: Bridging the Language Barrier with Intelligent Systems. Ed by Masoud Yazdani. 1993: p. 70-71.
[18] Özmen, H., The influence of computer-assisted instruction on students' conceptual understanding of chemical bonding and attitude toward chemistry: A case for Turkey. Cancer Detection and Prevention, 2008. 51: p. 423–438.
[19] Russell, A.L., Stages in Learning New Technology: Naïve Adult Emil Users. Cancer Detection and Prevention, 1995. 25(4): p. 173–178.
[20] Park, E.-k.a.M.S., Communication barriers perceived by older patients and nurses. International Journal of Nursing Studies, 2005. 42: p. 159–166.
[21] So, H.-J., Thomas A. Brush, Student perceptions of collaborative learning, social presence and satisfaction in a blended learning environment: Relationships and criticalfactors. Cancer Detection and Prevention, 2008. 51: p. 318–336.
[22] Chen, H.-Y., Kuo-Yu Liu, Web-based synchronized multimedia lecture system design for teaching/learning Chinese as second language. Computers & Education, 2008. 50: p. 693-702.
[23] DeVoogd, G., Computer use levers power sharing: multicultural students' styles of participation and knowledge. Computers & Education, 1998. 31: p. 351-364.
[24] Dilworth, T.J., Dave Mott, and Henry Young, Pharmacists' communication with Spanish-speaking patients: A review of the literature to establish an agenda for future research. Administrative Pharmacy, 2009. 5: p. 108–120.
[25] MacFarlane, A., Singleton, Carrie, Green, Eileen E., Language barriers in health and social care consultations in the community: A comparative study of responses in Ireland and England. Health Policy, 2009. 92(2): p. 203-210.
[26] Flores, G., Language barriers to health care in the United States. N Engl J Med, 2006. 355: p. 229-231.
[27] Towle, A., William Godolphin, and Ted Alexander, Doctor–patient communications in the Aboriginal community: Towards the development of educational programs. Patient Education and Counseling, 2006. 62: p. 340–346.
[28] 28. Polednak, A.P., Identifying newly diagnosed Hispanic cancer patients who use a physician with a Spanish-language practice, for studies of quality of cancer treatment. Cancer Detection and Prevention, 2007. 31: p. 185–190.
[29] Allwood, J., Monica MacDowall, and Sven Strömqvist, Barn, språkutveckling och flerspråkighet - En kristisk översikt, in Gothenburg Papers in Theoretical Linguistics S6. 1982, Linguistics: Göteborg.
[30] Allwood, J., ed. Power and Communication. ALVAR - a festschrift to Alvar Ellegård, ed. J. Allwood, Ljung. 1980, SPELL, University of Stockholm, Dept of English: Stockholm. 20.
[31] Ogbu, U., John, Minority Education in Comparative Perspective. Journal of Negro Education, 1990. 59(1): p. 45-57.
[32] Govender, I., The learning context: Influence on learning to program. Computers & Education, 2009. 53: p. 1218–1230.
[33] Benson Soong, M.H., Hock Chuan Chan, Boon Chai Chua, and Koah Fong Loh, Critical success factors for on-line course resources. Computers & Education, 2001. 36: p. 101-120.
[34] Daniels, H., Introduction to Vygotsky. 1996, London: Routledge
[35] Haenen, J., Outlining the teaching–learning process: Piotr Gal'perin's contribution. Learning and Instruction, 2001. 11: p. 157–170.
[36] Sawyer, R.K., The Cambridge handbook of the learning sciences, ed. R.K. Sawyer. 2006, New York: Cambridge University Press.
[37] Hmelo-Silver, C.E., Analyzing collaborative knowledge construction: multiple methods for integrated understanding. Computers & Education, 2003. 41: p. 397–420.
[38] Ligorio, M.B., Alessandra Talamo, and, Clotilde Pontecorvo, Building intersubjectivity at a distance during the collaborative writing of fairytales. Computers & Education, 2005. 45: p. 357–374.
[39] UD, U. Utrikesdepartementet 2009 [cited 2009 13/06/2009]; Available from: http://www.regeringen.se/sb/d/1475.
[40] Zlobina, A., Nekane Basabe, Dario Paez, and Adrian Furnham, Sociocultural adjustment of immigrants: Universal and group-specific predictors. International Journal of Intercultural Relations, 2006. 30: p. 195–211.
[41] Thurston, A., David Duran, Erika Cunningham, Silvia Blanch, and Keith Topping, International On-Line Reciprocal Peer Tutoring to Promote Modern Language Development in Primary Schools. Cancer Detection and Prevention, 2009. 53(2): p. p462-472.
[42] Lin, Y.-W., Enrico Zini, Free/libre open source software implementation in schools: Evidence from the field and implications for the future. Computers & Education, 2008. 50: p. 1092–1102.
[43] Klerfelt, A., Gestures in conversation – the significance of gestures and utterances when children and preschool teachers create stories using the computer. Computers & Education, 2007. 48: p. 335–361.

[44] Knutsson, O., Teresa Cerratto Pargman, Kerstin Severinson Eklundh, and Stefan Westlund, Designing and developing a language environment for second language writers. Computers & Education, 2007. 49: p. 1122–1146.
[45] Hull, D.M., Terrill F. Saxon, Negotiation of meaning and co-construction of knowledge: An experimental analysis of asynchronous online instruction. Computers & Education, 2009. 52: p. 624–639
[46] Barak, M., From order to disorder: the role of computer-based electronics projects on fostering of higher-order cognitive skills. Computers & Education, 2005. 45: p. 231-243.
[47] Kong, S.C., Lam For Kwok, A cognitive tool for teaching the addition/subtraction of common fractions: a model of affordances. Computers & Education, 2005. 45: p. 245–265.
[48] Lee, C.H.M., Yuk W. Cheng, Shri Rai, and Arnold Depickere, What affect student cognitive style in the development of hypermedia learning system? Computers & Education, 2005. 45(1): p. 1-19.
[49] Coffey, J.W., A meta-cognitive tool for courseware development, maintenance, and reuse. Computers & Education, 2007. 48: p. 548-566.
[50] Kay, R.H., The role of errors in learning computer software. Computers & Education, 2007. 49: p. 441–459.
[51] Biesta, G., Pragmatism as a Pedagogy of Communicative Action. Studies in Philosophy and Education, 1994. 13: p. 273-290.
[52] Schwartz, N., H., Exploiting the Use of Technology to Teach: The Value of Distributed Cognition. Journal of Research on Technology in Education, 2008. 40(3): p. 389-404.
[53] Gootman, E., At Charter School, Higher Teacher Pay in New York Times. 2008, New York Times: New York.
[54] 54. McVay , G.J., Pamela R. Murphy, and Sung Wook Yoon Good Practices in Accounting Education: Classroom Configuration and Technological Tools for Enhancing the Learning Environment Accounting Education, 2008. 17(1): p. 41 - 63
[55] Kurz, G., Rainer Falk Weber, International exchange of computer programs for engineering education. Computers & Education, 1983. 7(2): p. 121-124
[56] Farnworth, H., Mike Aston, Local viewdata—An international CAL resource Computers & Education, 1986. 10(1): p. 11-15
[57] Lewin, C., Rosemary Luckin, Technology to support parental engagement in elementary education: Lessons learned from the UK. Computers & Education, 2009.

David Hallberg is IT-Pedagogue at the department of DSV, Stockholm Universityt/KTH. He focuses mainly on technology enhanced learning, ICT4D and language and literacy issues in the context of (e-/networked-) learning.