www.ehu.es/revista-psicodidactica ISSN 1136-1034

Distributed Cognition in Community-Based Education

Cognición distribuida en educación comunitaria

Carlos Herrero* and María Brown**

*Universidad de Barcelona, **University of Malta

Abstract: According to the concept of distributed cognition or distributed intelligence (Pea, 1993; Wertsch, 1995), which is popular in current theories on learning, intelligence is not a property of individual minds. Instead it is achieved through the resources distributed in society: between people, and also between people, physical tools, and symbolic systems. Building on this perspective, people can achieve very complex goals through distributed cognition. When schools engage in joint projects with members of the community, many examples of socially distributed intelligence emerge; moreover, when people interact in more egalitarian ways, using this kind of collective intelligence, both the processes and the results are much more effective. This article describes various ways that distributed cognition functions in four schools in Spain that are being studied within the INCLUD-ED integrated research project. This type of organisation in these schools is reflected in two key practices: mixed committees and interactive groups in the classroom. Evidence of the pedagogical benefits of this approach is also provided.

Key words: Distributed cognition in community-based education, Interactive Groups, mixed committees.

Resumen: El concepto de cognición o inteligencia distribuida (Pea, 1993; Wertsch, 1995), popular en las teorías actuales sobre el aprendizaje, implica que la inteligencia no es una propiedad adscrita de la mente de los individuos sino que está distribuida entre las personas, y entre las personas y las herramientas físicas y los sistemas simbólicos. Así mismo, esta perspectiva indica cómo las acciones más complejas se resuelven con éxito a través de la cognición distribuida. En los centros educativos con proyectos de trabajo conjunto entre escuela y comunidad se encuentran múltiples ejemplos de inteligencia distribuida socialmente y de cómo esa inteligencia colectiva conduce a procesos y resultados mucho más efectivos cuando además las interacciones entre las y los participantes son más igualitarias. Este artículo ilustra las características de la cognición distribuida en múltiples áreas y espacios de cuatro centros educativos en España que se estudian en el proyecto integrado INCLUD-ED. En estos centros se observa este tipo de diseño tanto en la organización del centro, por ejemplo en las *comisiones mixtas de trabajo*, hasta en la organización del aula en *grupos interactivos*. Se exponen también datos que evidencian los beneficios de este enfoque para la mejora de la didáctica.

Palabras clave: Cognición o inteligencia distribuida, grupos interactivos y comisiones mixtas de trabajo.

Correspondence: Carlos Herrero. Mundet Campus, University of Barcelona. P.º Vall d'Hebron, 171, Edificio Llevant. 08035 Barcelona *(carlosherrero@ub.edu)*.

INTRODUCTION

In today's *information society*, children depend on interaction with everyone around them in order to learn. This is especially true in societies where dialogue is emerging as increasingly important (Flecha, Gómez, & Puigvert, 2003). In recent decades society has moved away from the *industrial society* towards a new model of social organisation, more focused on information and interaction between people; this helps explain changes in the social, economic, and cultural structures in various countries. This transformation has reached into all areas of society, from the most informal public spheres to scientific research. Dialogue has also taken on great importance in academia, where researchers now seek the contributions and reflections of people from outside the university to enrich their empirical studies. Likewise, children's conversations in the classroom with classmates and teachers are important to their learning, as are their reflections at home with family members, and with other adults they encounter everywhere in their daily lives. We all learn through interactions with others; their contributions enrich us and broaden our experience more than learning individually (Aubert, Flecha, García, Flecha, & Racionero, 2008). Thus it is important to encourage and coordinate children's interactions and conversations to ensure they learn as much as possible.

Another aspect of these current social and cultural changes is that societies are becoming more multicultural, and contributions from various cultures and societies are enriching all our cultures. This enrichment is leading people to develop other types of intelligence, which will be important to children's learning in our primary and high schools.

Among educational psychologists, the concept of intelligence has traditionally been based on an intelligence quotient (IQ), the result of one test. This has led educators to label students, and then to categorise and concentrate them as either the intelligent ones, or as lacking or problematic or deficient. Those in the latter group are taught the minimum curriculum, as they are considered less prepared to succeed at the academic curriculum, and not likely to reach the levels required for the majority of students.

However, the skills and basic competences included in academic intelligence are the result of learning, and that therefore they can be learned (Aubert et al., 2008). The fact that some children score poorly on IQ tests does not mean that they are incapable or less intelligent; the issue is instead that various factors can influence the results, including previous learning and opportunities for schooling, and their social and cultural context. These children can make up for these apparent lacks by learning through dialogue: interacting on an equal level with the whole educational community (teachers, classmates, family members, administrative staff, people from the commu-

nity, etc.). As each person takes a role in the learning process, they enrich it for the others, since people share their knowledge and benefit from what the others contribute. If we focus on abilities rather than deficits as a basic principle of learning, then we can maximise the benefits for all children (Elboj, Puigdellívol, Soler, & Valls, 2002).

In this article we analyse how distributed cognition contributes to the work of various schools. We base our analysis on practical examples in four schools that collaborated throughout the INCLUD-ED project. We divide these practices into two groups. The first group focuses on how children can succeed in learning, as educational practices based on distributed intelligence, such as Interactive Groups, are improving their academic results. In the second group this concept is applied to school organisation: mixed committees allow various members of the community to participate and contribute, making it possible for the school to provide more and diverse knowledge, skills, and resources.

The article is divided into three sections. We first explain how social cognition or distributed intelligence develops. We then discuss dialogic learning as the basis of intelligence, and finally describe two ways that distributed intelligence contributes to educational practices that help children succeed at learning. We look at *interactive groups*, a school-based practice based on distributed intelligence, and then show how practices based on distributed intelligence can apply to reorganising schools so children succeed. We conclude by summarising the article's main points.

SOCIAL COGNITION AND DISTRIBUTED INTELLIGENCE AND THE DEVELOPMENT OF INTELLIGENCE

Based on the idea that academic intelligence is the result of learning, that is, that it is always possible to develop it, we argue that academic knowledge can be acquired more effectively when it involves all the members of the children's community or environment. In other words, people learn, change, and develop based on the opportunities that others create for them in their environment. One of the main objectives of schools is to promote the interaction that encourages children to develop their knowledge and skills.

Childrens' scores on IQ tests do not determine their potential to succeed academically (López Cerezo & Luján, 1989). When children take intelligence tests, much more than their cognitive abilities are involved. Emotions also play an important role, including the confidence to complete the test correctly rather than to let their minds go blank because they do not believe in themselves. When children receive low scores on such tests, they internalise

the idea that they are not very intelligent; this belief then leads them to hold lower expectations of themselves (Rosenthal & Jacobson, 1968). Moreover, intelligence tests that measure only the individual aspects of a child do not take into account their potential to achieve in collaboration with classmates, or with help from others in their community and environment.

In contrast to this viewpoint that learning potential is based on people's IQ, various social scientists have argued that knowledge is a socially constructed practice, based on effort and dialogues between the various people who make up our societies. The concept of distributed intelligence is based on this approach.

Pea (1993) argues that, given the way distributed cognition develops, we must place all the resources within our reach at children's disposal so they can succeed academically. From his perspective, intelligence is achieved rather than possessed. His is a dynamic concept of intelligence: a process in which people engage actively. Thus, intelligence is not merely an innate faculty provided by our biological makeup. Instead, it has to be developed. Children develop it as they engage in educational activities in school, but also in other contexts outside the classroom. Therefore, to optimise this learning process, teachers must collaborate with the rest of the community, including families, since they are involved with the children on a daily basis. What produces, and increases, children's intelligence is their own participation, guided by a wide range of contributions from others.

Distributed intelligence (Pea, 1993; Werstch, 1998) develops when we place our knowledge at the disposal of the community, and thus use cognitive resources outside of ourselves, and inside other people or tools, to resolve the problems we face. Based on this premise, throughout our learning process we do not learn individually, but instead are influenced by the relationships we establish with people in our environment. Thus, we use the contributions and cognitive tools of other people, to resolve the problems we encounter both individually and collectively.

As Pea (1993) argues, intelligence has traditionally been defined as individual property. But individual intelligence rarely works in isolation. People understand more when they interact with other people, and have contact with symbolic and physical environments. The environment plays a mediating role when people engage in activities and in the social relationships each individual maintains with the rest of the community. This is why we must think about cognition in order to help students succeed in learning. Distributed intelligence, or distributed cognition, develops in many ways, which are as varied as the relationships people establish with their environment. Thus students can increase their intelligence through many approaches: they can use new information and communication technologies, or work with adults who come into their classroom, or engage in many other developmental activities.

In our modern society, which is increasingly multicultural and responsive to a wide range of cognitive contributions, people can no longer be considered intelligent simply because they know how to do something that helps their cultural community. Instead they are considered intelligent when they can solve problems by contributing interactively, and acting from a multicultural perspective. From this point of view everyone recognises the solutions, and they are seen as universally valid. As one teacher interviewed in INCLUD-ED, stated, «If you mix them up, they can enrich each other more. Everyone learns from everyone else. Everyone has something to teach, no?»

When people in an educational community participate together, contributing their previous knowledge and considering issues from their various perspectives, they all learn more; these are only two of the ways that distributed cognition manifests itself. In addition, people from other cultures are constantly moving into our societies, offering new and different viewpoints on how to interpret situations. Their various interpretations, transmitted through language, help increase the cognitive capacity of our societies overall, and especially of the individuals who live in them.

Knowledge moves from a social to an individual level through the constant transformation and interaction that leads to personal development. Based on this premise, Wertsch (1991) argues that a person's mental functions are not a mere copy of the organised social processes in his or her environment, but they are also the result of the individual transformation of these processes.

In related work, Hutchins (1996) analysed how distributed cognition makes a sociocultural contribution to the Information Society, using the example of technology to illustrate how distributed cognition functions. We do not learn how to use technology individually; instead, as Hutchins argues, by surfing the Internet all participants can learn how to use it. Then, through their contributions they can provide new knowledge to develop education based on information and communication technologies (ICT). Hutchins argues that knowledge is distributed through «surfing», and that, as people use it to share their learning, they gain knowledge more efficiently. Knowing how to surf the Internet involves, amongst other things, knowing how to use a mouse, and how to find the toolbar, and knowing that the Internet is organised into a series of sites one can access using specific addresses. Knowledge about «surfing the Internet» involves a whole group of elements without which a person would not be able to «know» how to do this. Hutchins (1993) states that «society has a different architecture and different communication properties than the individual mind»; thus it is possible that some «interpsychological functions… cannot ever be internalized by any individual» (p. 60). Thus he urges us to recognise socially distributed cognition systems as the units of cognitive analysis themselves. When people learn about ICT

and about how to use it they increase their intelligence about these technologies; by using the language of various ICTs people learn more, and interaction between participants also increases.

DIALOGIC LEARNING AS THE BASIS OF INTELLIGENCE

Dialogic learning (Aubert et al., 2008) is based on the idea that «knowing» is the result of a learning process that focuses on the interaction between all the people participating in the educational activity. This approach moves a bit beyond the basic idea of distributed cognition, because it introduces the concepts of agency and action into the learning process. Amongst other things, cognitive development is the result of a collective process of interaction, in which multiple actors participate. Seen this way, distributed cognition not only offers a way to increase instrumental learning for all students, but also promotes other important social values such as improved relationships and mutual support between children and others in the community. Through Interactive Groups, which build on dialogic learning, transformations occur in classrooms; distributed intelligence plays a part in this. The interaction that is established promotes equality between everyone involved, as well as increasing their learning.

Studies on cognitive development based on a dialogic approach provide evidence refuting the idea that learning is exclusively individual, and demonstrate that it is in fact a social act. Such findings force us all to reconsider the deficit models based on cognitive learning at an individual level (López Cerezo & Luján, 1989), because children do succeed academically when their individual intelligence interacts with the other forms of cognition, or intelligence, that operate in the social world around them. These other types of intelligence are bestowed on those who are learning through a variety of fields, academic and non-academic alike.

In addition, the dialogic approach to learning incorporates a new element into the debate on cognition: people's own positions in society—and the roles they play because of that position—have an impact on their learning because they influences the credibility or validity of their arguments.

Drawing on Habermas' (1981) theory of communicative action, the dialogic approach states that learning is a complex process in which individuals interact with each other. Cognition is understood as part of a social process focused on these interactions. People learn in a dialogic way, using arguments based on validity claims rather than power relationships. From the dialogic perspective, it is not enough to get people with different skills to work together in groups; the key to their success lies in creating egalitarian dialogue between them. People working together in egalitarian groups will use

their social skills without letting their social or academic status place any limitations on them. By engaging in egalitarian dialogue, people can share many more forms of knowledge; then their learning (cognitive development) can incorporate elements of the different viewpoints or explanations of the reality surrounding them. In fact, dialogic learning succeeds for two fundamental reasons. First, the entire community participates: family members, people from the neighbourhood, teachers, students, etc. Second, this participation is based on egalitarian dialogue.

DISTRIBUTED COGNITION AS A PREMISE FOR SCHOOL SUCCESS

One educational project that shows how distributed cognition can help children succeed through dialogic learning is the *learning communities* project. Through democratic interaction between the participants, thinking is shared —that is, cognition is distributed— and everyone involved learns effectively. Two applications of distributed cognition are the Interactive Groups in classrooms and the mixed committees in the *learning communities* schools. Below we describe how this cognition is developed both in classrooms and in school organisation.

Interactive Groups: Distributed intelligence in the classroom

Interactive Groups is a type of classroom organisation that is based on the idea of distributed intelligence. Some of the schools where this model of cognition is being developed, were selected to be part of the INCLUD-ED project.

In learning communities schools, interactive groups, are formed. The distributed intelligence becomes obvious to anyone who observes the academic performance in these groups. They are deliberately made diverse, and the adults who organise them, including the teachers, aim at creating many types of interaction, so that all involved develop greater individual and collective intelligence. One example of interaction between different cultures emerged when an interviewer asked a student whether the classroom included many students from other countries, and how the groups were set up to help them. She explained how they help one child:

> There are words she doesn't understand, or exercises she doesn't understand and she asks us in the group to help, and so, well, we, either the one who knows what it means, or the ones who are closest, explain it, and if she doesn't understand then we ask the teacher for help (Maria, student, Spain).

Distributed intelligence develops through an interactive process: a person involved in a specific activity distributes his or her knowledge into units of meaning that apply to the various processes that together make up that activity. Taking this definition as a starting point, people learn when they are capable of incorporating all the knowledge that makes up the activity or concept they are learning. In order to do so they use various cognitive strategies, including memorising, understanding, and reflection. In most cases, people learn thorugh a social process that has involved various types of interaction. When engaged in a task people talk to those beside them, and this interaction also forms part of this process of developing or acquiring distributed intelligence. Knowledge is distributed amongst everyone participating in the educational interaction. Therefore, the more people involved, the more interaction, and the more knowledge is distributed between the people in these groups. Distributed intelligence is greater when more people take part in the learning process. This is especially true if they are all working towards the shared objective of maximising learning for all children.

To show how distributed intelligence operates in these heterogeneous groups, we share examples from two of the schools involved in the INCLUD-ED project. The first is the Garden Learning Community in Albacete, a pre-primary and primary school. In this neighbourhood many people are unemployed and many youth feel marginalised; the neighbourhood population is made of people belonging to cultural minorities. These people live in a context of social exclusion —which is reflected in the school— but it made the neighbourhood school an ideal nucleus for a social transformation of the neighbourhood. Since the school became a Learning Community the academic performance of the residents' children, grandchildren, nieces, nephews, and cousins has improved. The children also have higher expectations for themselves, and think about continuing to study so they can provide a better quality of life to their families and the neighbourhood in general. Distributed intelligence has become profitable, and that has influenced the students' own learning processes. The community's overall cognition has also benefitted: children now turn to various members of the community to acquire more knowledge and skills, and are more eager to learn from everything around them.

When human resources are organised to do so, they can take better advantage of distributed intelligence than in other educational models. The Interactive Groups that are the everyday practice in the Garden school involve a range of different volunteers, from illiterate grandmothers to university students from the city. This diversity enriches the variety of interaction in the classroom, and therefore enriches this type of collective intelligence. The volunteers share their knowledge and their own ways of doing things

with the children, who then learn in a wide range of says, unleashing various cognitive processes. This interaction benefits everyone, and they may remain involved for many years. For example, one school administrator explained that «Mothers who had participated… later stayed on as volunteers… I mean, after their children had left school, [they] continued to volunteer in the school».

The second example is the elementary school The Forest, a Learning Community placed in Terrassa. This school is located in a peripheral, and very multicultural, neighbourhood, where increasing mumbers of immigrants have settled. In this Learning Community a student with special educational needs was included in an Interactive Group and his presence helped all the other students to do better academically. Given Pablo's[1] level of intelligence and his specific way of functioning, his classmates had to put themselves in his place and find different ways to understand the exercises they were doing. Pablo is a child with low-normal intelligence; before the Learning Communities project was implemented, he used to be taken out of the classroom, in order to follow a specific specially adapted curriculum. Working with him in Interactive Groups, his classmates had to learn to create links between the usual way Pablo functioned, and the specific requirements of the exercises. They built bridges between the two types of intelligence through interaction and dialogue. Both Pablo and his classmates benefitted from this interaction, as they all learned more and performed in new ways, searching for new strategies to help him understand how to calculate. Distributed intelligence would not have developed in this case if Pablo and his other classmates had been learning in different classrooms.

The inclusion and transformation that are generated in classrooms with Interactive Groups are clear in these statements from participants. By using the concept of distributed intelligence to analyse the interaction within the classroom we can provide evidence of how important the collaboration and solidarity are, both amongst the students and between them and the others in the classroom. This is expressed by Pepa, a teacher in the school in Terrassa. An interviewer asked if the students help each other as well, and she responded:

> A lot, of course. Because they do their worksheets. And then… they play games, something related to what they're doing… in the maths class, or language if they're in the language class… There are games with different levels of difficulty, because some of them are more advanced than others, and it's also good for them, because they help each other… Then if I'm there doing something with one of them and another one comes along,… I say, for example, «Tony, come and see if these sums have been done correctly», and they help each other.

Juana, a mother who volunteers in this Learning Community, made this comment:

> «… you try to perhaps explain… something but there is no better explanation than that [given by] a child to another child, no? Because they use the same words and language» (Juana).

These examples suggest that interactive groups based on the dialogic approach to education have great potential to engage community members through a process of radical transformation. Involving all the community members in the classrooms helps them become more critical and thus re-locate individual's contributions; Paulo Freire (1997) suggested this when built on the idea of transformative and empowering ideologies at the heart of community involvement. These groups provide all members of the community, including students, teachers, parents, and other family members, with the opportunity to share their own approaches to knowledge, drawing on validity claims rather than power relationships (Habermas, 1981). Thus learning becomes a more in-depth process: a process of distributed cognition shared by all those involved in the pedagogical practice, drawing on a plethora of different approaches, including formal, non-formal, and informal approaches to knowledge.

Organising schools based on distributed intelligence

The way these schools are organised is significant because they promote practices based on the idea of distributed intelligence. Often the policies in the school itself provide the framework for certain practices and either encourage or restrict schools in generating situations where students can use their intelligence in a distributed way. The Learning Communities project clearly illustrates how a school can maximise its opportunities to orient learning based on the idea of distributed cognition. The project is based on a radical transformation of the school, and its neighbourhood, in a process called «The dream of the school we would all wish for.» To begin this transformation everyone involved —children, family members, teachers, people from the neighbourhood— together develop a dream of the school they would like to create, to achieve more democratic and egalitarian education.

Once the various people involved have dared to dream, the schools are then structured based on dialogue, and democratic work and decision-making committees are also created. In these committees people can help to develop a consensus on the eventual steps to be taken. This consensus is reached

through dialog: it is the result of the various experiences, references and social representations that are part of the intelligences of all those involved. Thus all the knowledge that results is distributed across the entire community, and as the final agreement is made through dialogue, it incorporates all the units of meaning provided by everyone.

An adult education school in Barcelona perfectly exemplifies the impact that a dialogic orientation can have on constructing what we call «institutional knowledge», especially when the process is based on distributed cognition. This knowledge results as the people involved in the school respond to various situations that arise. Because of the dialogic context, everyone involved in the school has the same opportunity to contribute and participate, as all the relationships between them are based on equality. These relationships generate dialogic dynamics in the classroom which can also be transferred to the school organisation that is implementing democratic participation (Sánchez, 1999). The school is managed jointly by the community participants who are involved in learning processes and by the educators who teach the classes. Its three decision-making bodies are designed to promote open debate: the assembly, the school council, and the monthly coordination meeting (COME). All three spaces involve educators, volunteers, and learners.

The school assembly is an annual meeting; everyone involved in the school is welcome to participate, as well as neighbourhood people who want to help improve the school. This decision-making space allows any member of the community to propose solutions to resolve daily problems. The school council meets about every six weeks, and is a forum for deciding on functions and guidelines; it includes a representative of each group that has a voice in these decisions. It also includes various other representatives: of teachers, of the mixed committees, of the participants' associations, and of the community centre. During council meetings, the participants propose actions and discuss how to manage school resources and activities to improve learning for the participants.

Finally, a monthly coordination meeting (COME) is held to discuss the school's needs. For each meeting, a committee is created to describe current needs to the educational community. Here, participants decide on the priorities and criteria for interventions to improve the school; everyone is welcome to contribute their ideas and the the council makes the final decisions on what to implement. Thus the COME incorporates the intelligence of the community to improve the school's functioning.

One basic idea is common to all of these management spaces: egalitarian dialogue. Each person has the same opportunity to contribute and make suggestions; in a space where everyone can share their experiences, a collective cognitive process is generated and mediated by egalitarian dialogue.

As a result, people create solutions that are innovative, that involve solidarity, and that are shared by everyone in the various situations the school encounters daily. Thus the knowledge generated is a synthesis of the different experiences (units of meaning) that everyone shares, and which are distributed among them. The cognitive process of collectively creating knowledge, as applied in this school, shows how the creation of knowledge functions and the impact that its various forms can have on the final result. In this case, the idea of distributed cognition is especially striking in showing how collective processes function to create knowledge.

However, beyond the ideas proposed by Pea (1993), Werstch (1998), and others, our experience indicates that distributed cognition can also be used to understand the process of knowledge creation in organisations. As we have seen, through these school management spaces, the whole community can reach a consensus through dialogue by respecting the contributions of everyone else. These spaces also allow people to take part in professional development activities, and to help evaluate school programmes and generate new ideas. The responsibility for promoting the learning process is shared by the teaching staff and everyone else (Sánchez, 1999, p. 11).

In addition, some aspects of this kind of school organization also enable people to create multiple situations where the learning is based on distributed cognition. In the adult education school described above, the learning is based on interaction with others on an equal level. People discuss issues, and share questions and experiences so they can all learn together. They have the opportunity to change the school guidelines, as well as to discuss and debate them. Thus they create an environment that which makes it easier to participate confidently: an ideal situation for increasing knowledge because everyone in the school is involved.

This is not an isolated situation that applies only to the adult education school discussed here. Other examples also illustrate that the model of distributed intelligence is valid for showing how learning functions in social environments, such as a school. In Albacete for example, the Garden primary school was transformed from an educational model based on individual learning, with low expectations, to one based on egalitarian dialogue, where students' academic results have improved substantially. In addition to academic failure, this school also experienced conflicts between students and with the larger community. Then it was closed for a summer and opened again as a Learning Community. Faced with a difficult situation involving mistrust, low expectations from both students and family members, and the community's lack of confidence, the school decided to make a change. The tool used to initiate this process of transformation was school assemblies: two were held each day, for the pre-primary and primary levels. At these gatherings, everyone was given an opportunity to talk, to propose ideas, to

search together for a resolution to the issues the school was facing, and to achieve real learning for all children. Everyone was able to contribute their perspectives and experiences.

In this case too, distributed intelligence is a useful frame of reference for understanding this collective process of knowledge creation. This concept does not offer a complete explanation, because it does not cover collective creation, but it does focus on how people can learn something, because they have pulled together in their minds the various pieces of knowledge (units of meaning) that are distributed between the various objects, processes, or instruments surrounding them. On the other hand, the Garden school, like the adult education school, demonstrated that this process is also social, and that, through tools like egalitarian dialogue, people can create knowledge as all the participants discuss, and distribute, their experiences. Elena, a teacher at Garden school, explained how it works:

> …everyone participates in the dream stage for example,… and I had never seen such high levels of participation, in the mixed committees with family members, teachers…they participate a lot, they give their opinion a lot, they want everything to improve:… «Come and make your own project!» We are going to create a project together!» … It gives [them] a different incentive to say well I can contribute here, I can contribute my idea… We all construct it together and this is a huge opportunity and I think that's why participation and the enthusiasm to work is much higher, because the results can also be seen as well.

The cognitive contribution of all of the participants allows the various types of intelligence to come together in successful learning. For example, the children in the school, along with the adults (teachers, family and community members etc.) agreed on the school rules, which now form part of the school constitution. Creating such spaces for discussion encourages egalitarian dialogue between all the members of the educational community. In turn, through dialogue based on equality, everyone's thinking is taken into consideration, in order to improve the school. On the mixed committees, distributed intelligence makes it possible to hear, and take advantage of, various people's perspectives in order to transform and improve the community. Other examples along these same lines, observed in these various schools and projects, include improvements in the school environment, in interpersonal relations, and in the grades students obtain. They all illustrate our argument that knowledge results from a shared social process, using tools such as egalitarian dialogue.

DISCUSSION

James Comer, the driving force behind the School Development Program, quoted an African proverb: «It takes a whole village to raise a child.» Why is this so? It is because we need the contributions of everyone in the community to ensure that our children can develop as fully as possible, both educationally and personally. If it is true that learning functions as described by the theory of situated cognition, then to ensure that students succeed, we must encourage situations where multiple interactions take place, since they bring together all the pieces of knowledge distributed across a given learning context. Holding a dialogue with other people on something they are learning is one way to become aware of the different elements and details of an idea; and, since dialogue requires that we use ideas consciously, an internalisation process will naturally occur as well.

The study of intelligence has traditionally been focused on people's IQ, measured by tests. As many people know, and we have argued above, this approach tends to negatively label those children who do not share the discourse of those in power (Bernstein, 1977). However, educational, psychological, and social researchers have repeatedly demonstrated that the IQ does not help to explain either the learning process, or the various kinds of intelligence that students bring to the classroom, precisely because it overlooks the unique features that students bring, based on their own culture and social background, and focuses only on their levels of academic intelligence, based on test scores.

In contrast, in this article we have emphasised that the development of intelligence is a social process, involving various people who interact with students, using not a closed set of knowledge, but a plethora of situations in which knowledge is distributed. Hutchins (1993) described someone surfing the Internet: in order to know what it is, people must have previously learned what websites are, how to navigate them, what to do with the mouse, where to type in website addresses, etc. Thus knowledge about how to surf online is distributed in all of these ways, through all of these processes. Through interaction with other people, we learn each of these processes and imbue them with meaning, until we finally internalise the concept of surfing online. This is only one example of how the concept of «distributed intelligence» is essential if we are to understand how to help students succeed academically. Based on the premise that cognition is socially constructed, authors such as Pea (1993), Wertsch (1995), and Hutchins (1993) believe that the various intelligences that surround our children are crucial to their becoming adults.

Dialogic learning pulls together the contributions of all these authors. If we agree that we should all contribute our intelligence to help schools develop, we can do so by creating egalitarian dialogue, where children, teach-

ers, and community members can interact on a level playing field so that they all develop cognitively and increase the democracy in schools. Distributed intelligence can be developed in many areas of society. It is already operating in the schools that have become Learning Communities, which have successfully created Interactive Groups and mixed committees.

In schools organised this way, everyone can contribute their intelligence on an equal level to ensure that the children in the community succeed in school. Mixed committees are a clear example of distributed cognition. In the past, only educators were allowed to consider how to improve schools; others' perspectives on child development, though equally valuable, were pushed aside. But now, these groups make it possible to include the voices of everyone in the community; their contributions and perspectives are considered and heard in order to improve the school. Not only does the school structure become more democratic through dialogue; new learning pathways are also created through the contributions of people who have everyday contact with students, and others from outside the educational community.

Based on the data we have discussed here, dialogic learning is a useful theoretical approach to understanding how learning works, from the perspective of distributed cognition. Through the process of distributed intelligence, we pull together the elements distributed around us, and dialogic learning combines egalitarian dialogue with learning. This combination is essential for all children —and everyone— to learn successfully.

NOTES

[1] All names used in this article (persons and schools) are pseudonyms, to preserve the participants' anonymity.

REFERENCES

Aubert, A., Flecha, A., García, C., Flecha, R., & Racionero, S. (2008). *Aprendizaje dialógico en la sociedad de la información*. Barcelona: Hipatia. [Dialogic learning in the Information Society].

Bernstein, B. (1977). *Class, codes and control*. Vol. III: Towards a theory of educational transmissions. London: Routledge and Kegan Paul.

Elboj, C., Puigdellívol, I., Soler, M., & Valls, R. (2002). *Comunidades de aprendizaje. transformar la educación*. Barcelona: Graó. [Learning communities. Transforming education].

Flecha, R., Gómez, J., & Puigvert, L. (2003). *Contemporary Sociological Theory*. New York: Peter Lang.

Freire, P. (1997). *Pedagogy of the heart*. New York: Continuum.

Habermas, J. (1981). The theory of communicative action: Volume 1. Reasons and the rationalization of society and volume 2. Lifeworld and system: A critique of functionalist reason. Boston: Beacon.

Hutchins, E. (1993). Learning to Navigate. In S. Chaiklin and J. Lave (Eds.), *Understanding Practice: Perspectives on activity and context* (pp. 35-63). Cambridge: Cambridge University Press.

Hutchins, E. (1996). *Cognition in the wild*. Cambridge, MA: Harvard University Press.

López Cerezo, J. A., & Luján, J. L. (1989). *El artefacto de la inteligencia: Una reflexión crítica sobre el determinismo biológico de la inteligencia* [The intelligence artifact: A critical reflection about biological determinism of intelligence]. Bilbao: Universidad del País Vasco - Anthropos.

Pea, R. (1993). *Practices of distributed intelligence and designs for education*. In G. Salomon (Ed.), *Distributed cognitions: Psychological and educational considerations* (pp. 47-88). New York: Cambridge University Press.

Rosenthal, R., & Jacobson, L. (1968). *Pygmalion in the classroom*. New York: Holt, Rinehart & Winston.

Sánchez, M. (1999). La Verneda-Sant Martí: A school where people dare to dream. *Harvard Educational Review, 69*(3), 320-335.

Wertsch, J. (1991). Voices of the mind: A sociocultural approach to mediated action. Cambridge, MA: Harvard University Press.

Wertsch, J. (1998). *Mind as action*. New York: Oxford.

Wertsch, J., Del Río, P., & Álvarez, A. (1995). *Sociocultural studies of mind*. Cambridge: Cambridge University Press.

Carlos Herrero is a lecturer at the University of Barcelona for the Máster de Educación Secundaria [Masters in Secondary Education programme]. He has participated in various national-level educational projects, including some research and development, at CREA-UB, the Centre for Research in Theories and Practices to Overcome Inequality.

María Brown holds a Master of Arts in Sociology and is a PhD candidate in education at the University of Malta. She is part of the research team for the EU FP6 Includ-ED Project and lectures at the University of Malta. Her areas of specialisation include education, social policy, and employment. Her publications include *Discouragement Amongst Ageing Workers in Malta within an EU Context* (2009); forthcoming publications include articles on youth unemployment and the social capital of NGOs within an EU context.

Fecha de recepción: 17-06-10 Fecha de revisión: 20-08-10 Fecha de aceptación: 13-09-10