SELF-ORGANISING SYSTEMS FOR INFORMATION COMPREHENSION IN FOURTH-GRADERS OF NEW YORK CITY

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ABSTRACT

This investigation addressed how fourth-graders of New York City information found on the Internet texts to answer big questions in Self-Organised Learning Environment (SOLE). Two phases were conducted to first determine if fourth-graders were statistically significantly more capable of reading fourth and eighth-grade texts in groups with access to the Internet unaided by adults as opposed to individually and secondly to unveil how fourth-graders of New York City comprehended Internet information together in SOLE situations. A mixed methods approach was used to address this two-phase study: a quantitative approach determined mean differences for three different reading conditions, while a qualitative approach unveiled the mechanisms allowing fourth-graders to comprehend Internet information when in SOLE situations. Results showed that: fourth-graders of New York City are statistically significantly better at reading complex and at grade-level texts when they are in groups, Internet access is granted, and adult support is removed as opposed to reading individually. It was also unveiled that fourth-graders self-organise for reading in SOLE situations where the emergent phenomenon is information comprehension. This study advances the research regarding collaboration for online enterprises and better ways to prepare readers for 21st century demands. This study abided by Newcastle University's ethical approval procedure for conducting experiments and New York City Department of Education Committee for Research Approval to ensure proper and ethical research conduct.

Keywords: Reading comprehension, information comprehension, collaborative reading, New Literacies, complex systems, self-organized systems, Self-Organised Learning Environment (SOLE).

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Chapter 1. Introduction

Since the beginning of education in America, scholars and educators have tussled with the idea of finding best approaches to reading comprehension. Americans have swayed between phonics and authentic literature approaches without reaching agreement (Chall, 1983; Smith, 1986). Despite good intentions, students have demonstrated little improvement in reading over the last 40 years of instruction (National Center for Education Statistics, 2013b), making these efforts fruitless.

As part of these efforts, Americans have grown accustomed to adapting books to readers, using readability formulas and levelling systems. In the broadest sense, readability formulas measure and control text's complexity while levelling refers to the simplification of books to match students' reading skills (Fry, 2002; DuBay, 2004). Unsurprisingly, this simplifying measure has contributed to the present educational reading crisis (NGA Center and CCSSO, 2010; Renaissance Learning, 2013).

In the Spring of 2013, Prof Sugata Mitra was awarded the TED Prize for showing that in adult unaided environments children can almost teach each other anything using computers. Surprised by such statement, I tried Mitra's minimally invasive approach (Mitra and Rana, 2001) with a group of 5-year old dual language learners in New York City. When these young students attempted to read complex texts found in the Internet in the search for an answer to a given question, I began to question my use of level books to teach children reading; I wondered if students were in fact reading and how they were answering these questions. In observing these children, I also questioned what this reading comprehension meant in the ever-evolving context called the Internet. Should I still call it reading or does the process of understanding should be given a new name?

Although, reading comprehension is one of the most important skills needed to succeed in the 21st century (Casner-Lotto and Barrington, 2006), researchers of the brain (Wolf and Stoodley, 2008) and online reading (Leu *et al.*, 2013; Coiro, 2014) agree that reading is changing into a more sophisticated and complex process. Hence the urgency of research exploring new ways to better prepare students for more complex learning environments.

1.1 Context of the study

Upon joining the PhD program at Newcastle University, professor Mitra proposed a study aligned with my interest in SOLE and my personal enquiry to take place in public schools of the New York City Department of Education where this enquiry originated. It was then decided that the study should be conducted with fourth-grade students because in the Department of Education this is the first grade where students consistently use reading for learning as opposed to learning to read, therefore narrowing the scope of this study to conventional readers.

I first planned to measure if students could read complex texts better when in groups with Internet support as opposed to individually without access to the Internet because I found scarce literature about fourth-grade students reading complex texts. Then, I was going to measure if by the consistent practice of reading complex texts in groups, students would show significant improvement in reading comprehension measures. Therefore, I tested reading activities in a pilot study that failed its purpose as well as the students. After these results and learning that the Department of Education of New York City would not release test scores of its students, I changed the activities and purpose of the second part of the study: I built a SOLE laboratory (See Chapter 3, Figure 3.3) and collected data to understand how students comprehended Internet information during SOLE sessions. In brief, this study unfolded in a sequential manner: first to test a hypothesis, then piloting an activity for reading gains, resulting in the design of a new enquiry to unveil a comprehension process as shown in Figure 1.1.

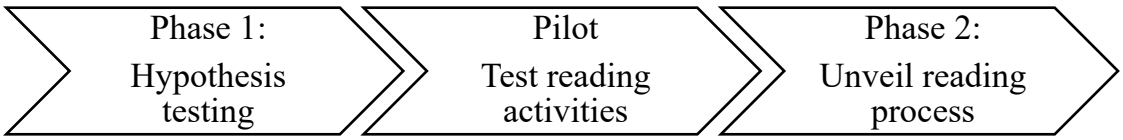


Figure 1.1 Phase by Research Purpose

Presently, I have discovered that learning has changed for humankind. There is not turning back to only using one mode of instruction for learning. Furthermore, reading has radically change to comprehending the intricate paths of the Internet, hence my interest to continue research in this new frontier in education through the SOLE methodology and beyond. Due to such dramatic change in education, the following

section will cover the history of schoolbooks in America to show how this change needs new approaches.

1.2 History of schoolbooks

The purpose of the following history of reading is to find the roots influencing the present state of reading instruction in America. The primary mode of reading instruction in the present time is the use of level books. Uncovering the reason for this practice will contribute to the understanding of how reading has changed with the introduction of the Internet.

The history of reading instruction, research, programs and approaches has evolved along with the history of the United States. They represent the turmoil related to the settlement of a new nation, defining moments of establishing a cultural identity and the struggle to compete against the worlds' most powerful nations. The history of schoolbooks is a vivid representation of this nation's effort to educate its young.

The reading instruction in America was founded on religious beliefs and a need to establish a new country. The first schoolbooks were religious in nature, made to maintain cohesive colonies (Spring, 1994). This period was characterized by an initial inclination to define reading from a decoding perspective (Dodds, 1967). Effects of such approach were not taken into consideration and refuted until the 1900s.

The years of the American Civil War (1861–1865) marked a new educational period (Spring, 1994). Seeking to form an identity for its diverse population through educational policy and to depart from English traditions, America adopted new reading approaches and books created by Americans to replace the English educational system (Elliott and Woodward, 1990).

As the American population increased, student enrolment in Common Schools soared, making reading instruction challenging and unmanageable (Bailyn, 1960), hence the appearance of the first level book series—McGuffey Readers—that were introduced in the classroom in 1836. Teachers welcomed the different levels of complexity in the readers that allowed for differentiated instruction, and therefore more manageable classrooms. These books contributed to the idea of controlling for complexity by sequencing books to suit reading competencies of children at different grade levels (Betts, 1949). These series pioneered the idea of a numerical system based on degree of

reading complexity as well as schoolbooks as a commodity (Fry, 2002). They marked the beginning of an interdependent relationship between teachers, publishers, researchers, educational policy, and the American curriculum.

At the turn of the 20th century, a rapidly increased population of immigrants and minorities forced Americans to establish a new hierarchical system (i.e. men as school managers and women as teachers), grade levels, and de-culturalization and assimilation of immigrants and indigenous people. America standardized education to better assimilate its growing population. For the first time, education psychology and brain research approached reading from a scientific stance. Links were found between brain injuries and reading difficulties (Hallahan and Mercer, 2001) while a shift from oral to silent reading occurred when it was found reading silently was more efficient. All these discoveries enforced the use of more scientific methods in education.

Scientists used reader books (i.e. the name adopted after the McGuffey readers) to influence teaching (Shannon, 1989). However, teachers, unaware of scientific discoveries, attributed student's deficient reading skills to the lack of books at the students' reading level and a need for measuring text difficulty materialized. In 1921, Thorndike published The Teacher's Word Book, which presented words ordered by frequency of usage based on his own scale for vocabulary control (Monaghan and Barry, 1999). Then, Lively and Pressley designed the first readability formula to effectively identify books by level of text complexity (Smith, 1986). Readability formulas were established and the period known as the Dumb-Down Education began, were schoolbooks were made with highly predictable syntax, less sentence complexity and limited vocabulary (Flesch, 1981). Books were over-simplified to the extent they prevented use of predictions and inferences in readers, which are essential for improving reading comprehension (Snow and Juel, 2005; McNamara *et al.*, 2011). Accordingly, publishing companies determined the reading skills that would accompany each book (Hoffman *et al.*, 2002). These levels were not scientifically determined but a commercial measure widely accepted at the time and modified to meet the needs of the diverse population of the United States.

The economic and political situation in America influenced the quality of education during the Great Depression (1930–1939). World War II (1939–1945) led to a boom in manufacturing of American products, (Carter *et al.*, 2006). Perceived as human capital, students were trained in the basics of labour work and the standardization of mass

education (Kliebard, 1988), diluting the quality of education. Instruction focused on the basics, that is, decoding books, handwriting, and learning how to perform simple mathematical operations.

Around 1930, scientists created Basal Readers (i.e. scripted schoolbooks of controlled vocabulary and text) and teacher manuals (Shannon, 1989). Publishing companies supplied these materials and teachers followed these books as a prescription, unaware of their connection to research, while leaving the veracity of these materials unquestioned. In response, publishing companies equipped classrooms with textbooks, flash cards, workbooks, teacher guides and a wide variety of Basal Readers (Burns, 1976), enforcing the power of publishing companies and further homogenizing education, which was detrimental to young readers. While this practice was unsupported as research was still inconclusive, it was perpetuated by publishing companies that appealed to notable figures of education to standardize the use of Basal Readers in schools (Monaghan and Barry, 1999). Basal Readers grew in popularity and by 1940 about 90% of schools in America used them as the only source of instruction (Shannon, 1989). However, when concerned parents and teachers questioned the lack of phonics instruction in these books, supporters quickly justified them by referencing false research results (Flesch, 1981).

In 1946, Betts (1946) presented the first framework for text difficulty. He proposed four levels for teachers to differentiate reading instruction. The practice of levelling students to books was conveniently adopted yet unscientifically proven. However, it has become the most common approach to instruction today. This will be discussed in ensuing sections.

After World War II, unprepared to manage the birth-rate spike of the 1950s, American schools struggled to oversee the education of all students (Hoffman, 2008). Classrooms were unequipped to handle 30 to 60 students at a time, with limited human and material resources. Overpopulated schools forced teacher attrition and low-quality education.

The Civil Rights movement generated permanent changes for minority groups (Spring, 1994): federal and state policies ensuring integrated, free and appropriate public education for all. Yet, entities perpetuated segregation and inequality: publishing companies struggled to balance sales of books depicting a wider range of American

cultures (Spring, 1994). Consequently, government policy enforced the use of multicultural books in schools to promote the proliferation of these books.

The effects of the Civil Rights and desegregation movements persist today for those who participated in integrated schools. Johnson (2009) found that African Americans who attended desegregated schools "significantly increased both educational and occupational attainments, college quality and adult earnings, reduced the probability of incarceration, and improved adult health status; desegregation had no effects on whites across each of these outcomes" (p. 1). He attributed these results to improvement in access to school resources reflected in reductions in class size and increases in per-pupil spending for schools that adopted appropriate desegregation policies.

In 1957, the former Soviet Union launched Sputnik, the first satellite to orbit Earth (NASA, 1997). The world watched in admiration as the Soviet Union demonstrated technological and scientific superiority over Americans. A month later, the Soviet Union sent a dog to orbit Earth; finally causing Americans to blame this perceived defeat on the educational system. In all circles of society, teachers, schools and education were scrutinized and criticized (Hoffman, 2008), initiating educational reform at all levels.

Unprecedented economic support was given to curriculum reform projects in schools (Elliott and Woodward, 1990). In 1959, according to Hartman (2008), Professor Bruner specialized in developmental psychology, proposed the reinstatement of the Progressive Movement in which students learned by discovery and hands-on experiences and gave teachers the power to create their own lessons (Hartman, 2008), opening the market to science books and materials. The mass production of teacher manuals with predetermined questions and quizzes, workbooks, textbooks, and compartmentalization of science education proliferated (Venezky, 1987). However, professional development and opportunities for teachers to design their own curriculum declined after a few years and the Progressive Movement initiative ended once more. This practice was abandoned, and the well-known compartmentalized education was established.

In this environment, Americans were struggling to develop reading comprehension skills and Professor Flesch (1981) a researcher of reading, openly blamed student reading failure to the lack of phonics training, which enabled students to decode words. These accusations caused uproar and divide among educators and a renewed Reading

War (Chall, 1983). As a result, publishing companies incorporated phonics instructions into Basal Readers.

Reading War ended when in 1967, Professor of education Chall (1983) published an extensive analysis of 55 years of research on reading approaches. Chall (1983) concluded that investigations in reading instruction were inconclusive and contradictory, however a code-emphasis method (i.e. phonics) presented more positive results and therefore it was recommended for the instruction of reading. In addition, supporting Chall's findings but lacking empirical evidence, Fry proclaimed the teaching of words in family clusters (Durkin, 1987). Thus, Basal Readers morphed to include scholars' ideas, and decodable texts were created and are still in use today.

In late 1970, the first studies on collaborative/cooperative learning were conducted. Defined under Piaget's and Vygotsky's theories of child development and knowledge acquisition (Tudge, 1992), they focused on the effects of group work on student individual skill acquisition and cognitive gains (Azmitia, 1988), different areas of learning such as reading (Dillenbourg *et al.*, 1995), and in the last 20 years on social networking (Stahl *et al.*, 2006) due to advances in technology. Peer collaboration/cooperation has demonstrated positive gains in reading comprehension discussed in subsequent sections of this thesis. Overall, positive results were noted in this period, but America failed to recognize that students, teachers, and scholars benefited from creating their own situational learning and thus abandoned this practice.

Prior to the 1980s, the study and teaching of reading focused on its mechanics (i.e. phonics and decoding), assuming that comprehension was a consequence of those skills. In 1985 the Report of the Commission of Reading proposed a change from decodable to richer and authentic text, phonics and vocabulary instruction, and more time for independent reading and writing (Anderson, 1985). The report urged the use of manuals as guides for reading instruction, endorsing Basal Readers if these were modified to meet new recommendations. Finally, the commission reported a scarcity of research on reading comprehension and therefore, recommended its study.

However, in the early 1970s scholars from different research disciplines provided new views into reading comprehension. Cognitive psychology gave birth to behaviourism, cognitivism and constructivism, which view reading in its own terms (Pearson, 2014). However, to understand how each discipline interpreted and impacted reading

comprehension, it is important to understand its connections to the Objectivist and Constructivist paradigms. Jonassen (1991) explains that Behaviourism and Cognitivism are conceived in the Objectivist paradigm which understands reality as external to the individual. Therefore, learning is determined by external agents such as teachers, schools, and curriculums; as a result, the learner reflects the external factors given by these external agents. For behaviourists, the goal of instruction "… is to elicit the desired response from the learner who is presented with a target stimulus." (Ertmer and Newby, 1993, p. 47). Behaviourists only focused on observable and objective behaviours, therefore, existence of the mind and internal mental processes were denied since they could not be observed or proven (Jonassen, 1991). In this sense, reading comprehension was achieved through the teaching of endless reading skills, which were presented to the student in a stimulus-response basis. Learning is "…accomplished when a proper response is demonstrated following the presentation of a specific environmental stimulus." (Ertmer and Newby, 1993, p. 48). Although in the early 1900s influencing figures like Thorndike (Pearson, 2014) made a clear distinction between skills needed to read and the association of comprehension with consciousness, the field of reading comprehension and education in general was dominated by these behaviourist views. The need for standardized assessments solidified this stimulus-response view of reading when behaviourist provided measurable ways of assessing large numbers of readers. Teaching focused on skills needed to achieve reading scores, a relationship that persists until today.

Until linguists asserted that structures of language affected the act of reading (Pearson, 2014) behaviourist views of reading were not brought into questioning. In 1957, Chomsky (2002) published his groundwork in linguistics where he criticised behaviourist for denying internal human structures needed for language to emerge. This provoked a paradigm shift in different areas of child development, psychology and education, which gave way to the cognitive movement.

Cognitivism focuses on the study of mental processes that support human cognition and therefore it is concerned with what students know and how they acquire it (Jonassen, 1991). For instance, psycholinguistics advocated for natural language patterns in books and referred to reading errors as valuable windows into students' thinking processes (Bloome and Green, 1984). In line with Chomsky's work, cognitive phycologists

maintained that reading was an interactive process between reader's knowledge, strategies, and text (Dole *et al.*, 1991).

However, cognitivism still viewed learning and reading as a response to a stimuli with a focus on how "…information is organized, received, stored, and retrieved by the mind" (Ertmer and Newby, 1993, p. 51), that is, it assumed reality and learning as external to the individual. For this reason, Jonassen (1991) advocated for Constructivist approaches to the understanding of learning and instruction since it viewed reality as an internally mediated process.

Constructivism was a shift in understanding of reality, knowledge and learning. It proposed that knowledge could not exist outside of the learner but it was constructed by the learner as he/she interacted with the environment and adapted to it (Glasersfeld, 1989). In this sense, Piaget (1964) change the view of learning, learner, reality and knowledge, when he posited,

> "To know an object, to know an event, is not simply to look at it and make a mental copy or image of it. To know an object is to act on it. To know is to modify, to transform the object, and to understand the process of this transformation, and as a consequence to understand the way the object is constructed." (p. 177).

From this stand point of view, knowledge is constructed and what we know as reality comes from that construction of knowledge: "Humans create meaning as opposed to acquiring it." (Jonassen, 1991, p. 55). This radical change in perspectives, brought new understandings and positioning regarding learner, knowledge and reading comprehension. For instance, if the learner was to create his/her own meaning, then right or wrong answers become irrelevant, which opposes the views of behaviourists and cognitivist approaches to learning. Understanding and teaching of reading also changed. In Constructivist terms, "…readers are encouraged to build unique models of meaning for the texts they read." (Pearson, 2014, p. 34). For teaching of reading, this meant that the role of the teacher was to elicit instances for the construction of meaning: "…scaffolding and coaching, to facilitating and participating as students develop greater competence, confidence, and independence…" (Pearson, 2014, p. 37).

In more recent years, with the introduction of the Internet and other technologies into schools, a new paradigm for learning has emerged. Explained in Chapter 2, Complexity Theory (Davis and Sumara, 2006) is giving a better understanding of learning

communities, distributed knowledge and cognition and how connectivity is at the heart of the construction of reality. In this sense, Connectivism, pioneered by Siemens (2005) has emerged as one of the leading theories of the field.

In summary, this shift to comprehension has followed an almost natural process of understanding. Beginning from an outside view into human behaviour (i.e. Behaviourisms), then exploring the possibility that the mind needs to form mental processes to understand an outside reality (i.e. Cognitivism) to the understanding that reality is constructed by the individual in its interaction with the environment (i.e. Constructivism), to finally acknowledging the work of the interactions of humans and artefacts for the shared creation of knowledge (i.e. Complexity theory and Connectivism).

Once comprehension research started to emerge, a new demand for children's books materialized and pictorial child-friendly books were welcomed into classrooms. Also, after more than 50 years in the market, Basal Readers sales declined and were forced to abandon their traditional approach: vocabulary control, skill training and controlled passages became obsolete and they were replaced with authentic children literature, genre diversity, and fewer and more sophisticated words (Pearson, 2009), changing the book market to accommodate new demands.

Level books are sequential, complexity-controlled books that increase in difficulty according to the grade level and ability of the reader, however, they differ from Basal Readers on the authenticity and richness of their stories and the more natural language found in the books (Shannon and Crawford, 1997). Its appealing nature (i.e. a text difficult enough for the reader yet more enjoyable) has made these books the leading materials of instruction in America in the present time.

1980 marked the beginning of educational reform as a political platform. It began with Reagan's administration shifting educational power from federal to state governments and local businesses (U.S. Department of Education, 1983). In 1992, President Bush Sr. signed the Goals 2000 Educate America Act, with an emphasis on preparing students for the workforce, while Clinton's administration added funding to pre-kindergarten and adult education. As a result, schools worked towards meeting the goals set forth by local business with funding from the federal and state government.

During these political reforms, in 1994 the National Association of Educational Progress reading report triggered a political battle because of the poor performance demonstrated by California students. This ended with the Reading Excellence Act (Goodman, 1998); it provided funding in early literacy instruction for low performing schools, limiting reading programs to only those supported by research (Roller, 2000).

Thereafter, the National Reading Panel published a report on reading research (National Reading Panel, 2000), setting criteria to favour scientifically based research. However, this panel only reported experimental and quasi-experimental research (Cunningham, 2001), excluding other types of research important to the understanding of reading instruction. This recommendation contributed to a skewed vision of what reading entails.

In 2001, President Bush passed the No Child Left Behind Act (NCLB), which held schools and teachers accountable for students' test scores by monetarily rewarding passing schools while sanctioning low performing schools (Bush, 2001). This brought detrimental consequences to the education of young students, especially those in poverty, English language learners, and students with disabilities for whom high test scores were difficult to achieve (Darling-Hammond, 2007). NCLB forced schools and publishing companies to support programs oriented at achieving high test scores.

An increase on phonics training and drills was observed, while a lack of critical thinking and problem-solving training negatively affected students' reading abilities (Cummins, 2007). The most affected students were those from economically disadvantaged areas for whom poor instruction was common and who after failing tests faced school closings and reforms (Ryan, 2004).

In 2009, President Obama passed the educational act Race to the Top (RTTT), seeking significant reform with attention to four main areas: learning standards and assessments; data systems to measure student growth and to inform instruction; preparing effective teachers and principals; and improvement of lowest-achieving schools (U.S. Department of Education, 2009), with emphasis on research-based practices.

In 2010, the Common Core Standards Initiative (CCSS) was launched to align all American states to a national curriculum to prepare students for college, the workforce, and to benchmark education to international expectations (EngageNY.org, 2012).

Participating states implemented standards, teacher evaluation procedures and aligned curriculum and state assessments to meet CCSS goals.

Upon implementation, New York City Department of Education recommended reading programs, presumably research-based (New York City Department of Education, 2013). This were evaluated under a four-point criterion: text selection (i.e. complexity and range of quality); questions and tasks; academic vocabulary; and writing instruction. However, upon reviewing the fourth and eighth grade programs, only a superficial alignment between programs and CCSS was observed (Pearson Education Inc., 2014). These programs provided students with higher complexity texts but with the same approaches that have failed students in the past: Basal Readers.

Finally, CCSS has focused on raising text complexity levels to bridge the gap between school and college texts. Using the commercial measure Lexile® to determine text complexity (Duke and Mallette, 2011), school grade level bands have been raised. For instance, for fourth and fifth grade formerly 645 to 845 Lexile® is now 770 to 980 Lexile®. However, it is still unclear the criteria used to raise text complexity and its effects on reading comprehension.

In summary, the history of schoolbooks for reading instruction exemplifies the American efforts to educate their young. Reading texts and strategies have morphed according to political circumstances, historical events, research discoveries, and philosophy of education trends. As Bowles (1976) rightly posited:

> The educational system, perhaps more than any other contemporary social institution, has become the laboratory in which competing solutions to the problems of personal liberation and social equality are tested and the arena in which social struggles are fought out. The school system is a monument to the capacity of the advanced corporate economy to accommodate and deflect thrust away from its foundations. Yet at the same time, the educational system mirrors the growing contradictions of the larger society, most dramatically in the disappointing results of reform efforts. (p. 5)

America has transformed itself into a cluster of educational approaches and programs. Some of these have been shown to support and others to fail the education of students, and both indiscriminately continue to reach classrooms in America. Basal readers exemplify the transformative nature of reading education in America. For decades, America has swayed between two reading aspects: the mechanics of reading (e.g. alphabetic method) and purposeful reading (e.g. literature-based approach) and although

complementary, programs and approaches have mostly included one or the other. Basal readers have morphed according to the approach on trend to maintain status and sale opportunities in the educational market, which is far from meeting the needs of students.

What most of these approaches and programs have failed to address is the complex and situational nature of reading (Gee, 2001). Unsurprisingly, successful reading approaches rely on how they are used to suit the needs of the reader, that is, approaches that use a combination of teacher support in planning and implementation to differentiate student instruction have been demonstrated to be most effective (Slavin *et al.*, 2009). Teachers adopting these approaches do not adhere to particular programs; instead they are naturally prompted to adapt the curriculum, mode of instruction, and even book selection to the needs of students, replacing scripted programs for better implementation.

In subsequent sections, it would be observed that with the introduction of the Internet, students are required to look for information and learn in a different way, the reading demands have not only increased but changed (Leu et al., 2013). For this reason, current approaches fall short to address these demands and new strategies are needed.

1.3 Problem statement

This study questioned the overuse of offline reading, text-controlled measures, and other of such scaffolds as indispensable tools for the instruction of reading. Although educational policy in America revolves around such measures (Coiro, 2011), emergent technologies, more precisely the Internet, and modern educational and economical styles are placing new demands on students and citizens which are difficult to address in highly scaffolded and controlled environments. Ultimately, this study aimed to find a modern approach that is better aligned with America's 21st century expectations.

Adapting texts to readers' abilities is an almost 200-year-old practice in the United States (Smith, 1986), and one of the most prominent compensatory measures in reading instruction. The overuse of this practice has contributed to the present educational crisis (NGA Center and CCSSO, 2010) and America continues to sway between a diversity of approaches without favourable results. Looking closely at factors contributing to this crisis, a persistent gap between school and college texts is found and attributed to a 50-year decline of reader complexity levels (Hiebert and Van Sluys, 2014), however, the

field is yet to acknowledge the gap between Internet use in schools and college. Despite efforts of Common Core Learning Standards (EngageNY.org, 2012) to bridge this gap by increasing text complexity, this measure not only falls short but also is suspected to harm readers because it increases reading demands without providing student support. There is a need to understand if text complexity should still be the focus and reason for this crisis, while finding better ways to lessen the gap between school and college reading expectations.

Technology has placed new demands and with two thirds of Americans using the Internet, technology has taken a central role in education and professional arenas (U.S. Census Bureau, 2013). President Obama launched a campaign to connect all Americans with the Internet (U.S. Department of Commerce, 2013) seeking to improve the national economy and competition in global markets. As a result, professional entities are demanding of graduates the development of collaboration, critical reading, and technological abilities (Casner-Lotto and Barrington, 2006) which are expected to translate into highly productive work environments.

Casner-Lotto and Barrington's (2006) study of 400 employers in the United States declared reading comprehension, English language, writing, collaboration and oral communication as the most important skills needed in the 21st century. However, half of the employers believed high school students had deficient skills, while the other half considered students adequately ready but not excellently prepared for the workplace. The findings by the New York City Department of Education in 2013 and 2014 that only a quarter of students were reading proficiently and that less than a third were ready for college and the workforce (New York City Department of Education, 2016a) suggests that high school graduates are ill prepared to succeed in academic and economic environments due in part to deficient reading, collaborative and communicative skills.

Jackson et al. (2011) found that students who used the Internet more scored better on standardized reading tests and had better grade point averages in school than less frequent users. However, Internet access is not a reality for all Americans. Department of Commerce (2011) found a high correlation between Internet access, educational degree, income, and ethnicity, uncovering an accessibility gap for people with basic academic degrees, low income, and belong to minority groups. This evidence points at

the need for accessibility, usability and ultimately, educational solutions to support national goals to compete in global markets.

Schools are a possible solution to the digital divide and while 66% of school-age students used the Internet regularly not all have Internet access at home (National Center for Education Statistics, 2013a), making school the main access point for one quarter of those without Internet at home. Additionally, three quarters of teachers in America have reported the use of computers as instructional tools, and of these teachers, 94% use Internet in class. Schools all over America have resources to lessen the digital divide, and research is needed to find how it is being used in schools while finding educational approaches that prepare students for the contemporary workplace.

In seeking solutions to the reading crisis and digital divide, a literature review of group reading studies—discussed in Chapter 2—revealed a persistent use of compensatory measures to improve reading skills: teacher intervention, comprehension questions, and peer-tutors are common tools used to support reading comprehension in groups (Palinscar and Brown, 1984; Rojas-Drummond *et al.*, 1998; Rojas-Drummond and Mercer, 2003). However, with the introduction of technology in schools, there is an emergence of studies endorsing collaborative online environments with limited teacher intervention for the improvement of reading skills (Coiro and Dobler, 2007; Castek *et al.*, 2012; Kiili *et al.*, 2012; Mitra and Quiroga, 2012) and other skills, thus providing a modern solution to the reading crises worth exploring.

Assuming students should always be matched to appropriate reading levels, this literature review also shows that most studies ignore the influence of reading material and the environment on group reading practices. In the last decade, online reading has challenged this assumption. The lack of text control measures in the Internet has the reader confronting a diversity of texts. However, unlike offline texts, online reading provides ready-to-use scaffolds such as dictionaries, videos, images, and links to topic related texts (Coiro, 2011), enhancing the reading experience. Recognising students as Internet users and the importance of proficient readers in the 21st century, a need is identified to seek quality approaches to online reading.

1.4 Hypothesis

This research tested a new idea and uncovered the mechanism of an approach on fourth graders in New York City. It aimed to question and expand preconceived notions of

students' abilities to read texts in groups, the need for traditional scaffolds (i.e. teacher intervention, peer-tutors, text complexity levels matching readers' abilities, etc.) and extensive need to control text complexity as a central measure for students to develop reading comprehension abilities. Most importantly, this study aimed to contribute new ideas to the body of research concerned with SOLE (Mitra, 2014b) as a better way to prepare life-long readers, that is, a more collaborative and socially mediated approach for the co-construction of reading comprehension.

More precisely, fourth-graders read texts without adult assistance or instruction under different conditions: offline eighth-grade level texts in groups to solve reading comprehension questions while using the Internet as a supporting tool to answer these questions. They also performed Internet searches in SOLE situations to answer a big question. The proposed combination of elements was intended to emulate scaffolds naturally found in everyday human activity, such as collaboration, communication, construction of meaning in conversations with others, and use of the Internet for research and clarification purposes. This study not only tried to find a possible solution to the current reading crisis but also a vision into what reading could be in the future as technology offers more possibilities for students to learn together.

1.5 Research question and sub-questions

The following are the main question and sub-questions of the study:

How do fourth-graders of New York City comprehend Internet information to answer big questions -complex and open ended in nature- in Self-Organised Learning Environment (SOLE) sessions?

Sub-questions:

1. Is there a statistically significant difference in comprehension scores of New York City fourth-graders when reading eighth-grade texts in groups with the Internet as a search tool as opposed to reading individually without Internet access?
2. Is there a statistically significant difference in comprehension scores of New York City fourth-graders when reading fourth versus eighth-grade texts in groups with Internet as a search tool?

3. What do fourth-graders of New York City do to comprehend Internet information when asked to solve a big question during SOLE sessions?

1.5.1 Question selection rational

Based on Onwuegbuzie and Leech's (2006) classification of research questions, this is a mixed methods enquiry because it required a sequential use of quantitative and qualitative methods. The questions were appropriate for exploring reading comprehension in groups, celebrating the very nature of reading: a dynamic, socially constructed and multi-layered process.

In order to unveil this process, research questions were answered sequentially: to establish occurrence of an unexplored phenomenon and understand a complex phenomenon (Newman *et al.*, 2002). First, comprehension without use of scaffolds was determined when students read complex texts. These findings led to determine which condition was more conducive to comprehension in groups: reading fourth or eighth-grade texts. Then, it became relevant to find how young students comprehended information found on the Internet. A pilot study was used to first find a suitable group reading activity and findings indicated the need to modify such activities. Finally, SOLE was used to unveil the process of group information comprehension in adult unaided environments. This sequential enquiry -shown in Figure 1.2- unravelled layers of reading comprehension in collaborative groups, until a compelling argument was built to answer the research question.

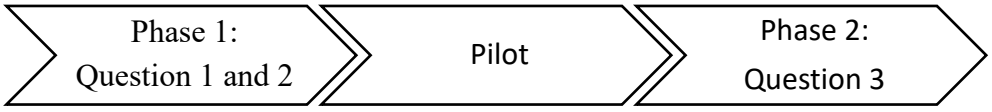


Figure 1.2 Phase by Research Question

1.5.2 Research hypothesis in null form for questions 1 and 2

The following hypotheses correspond to the first two research sub-questions. They are enumerated in the order in which they were answered:

$H_{1.}$ Fourth-graders in New York City public schools will not display statistically significant difference in comprehension scores when reading eighth-grade texts

individually compared with group reading with Internet access for research support as measured by scores obtained on text comprehension questions.

$H_{2.}$ Fourth-graders in New York City public schools will not display statistically significant difference in comprehension scores when reading in groups with Internet access for research support of fourth-grade texts compared with reading eighth-grade texts, as measured by scores obtained on text comprehension questions.

This thesis work is divided into 5 chapters. Chapter 1 explains the motivation, purpose, questions and structure of the study while providing some context into how the instruction of reading has changed overtime in America. Chapter 2 presents a theoretical framework and literature review for study of reading in groups and in SOLE situations. Additionally, other theories of explanation are presented and discarded due to the scope of this study. Chapter 3 presents the undertaken methodology to answer research questions. It is divided into the phases of the study to ensure differentiation of methodology according to the research question. Finally, the ethical considerations undertaken in the investigation are explained with special consideration to the young participants of this study. Chapter 4 shows analysis of data for both research phases: phase 1 is a statistical analysis to establish or refuse a null hypothesis, while phase 2 is a qualitative analysis of the interaction of children for Internet comprehension in SOLE situations. Finally, chapter 5 discusses the findings for both phases and its connection to prior and future research SOLE endeavours.

Chapter 2. Literature Review

2.1 Introduction

The purpose of this section is to provide a theoretical framework to explain the nature of reading and Self-Organised Learning Environments (SOLE) as one possible medium to address the historical issues around its instruction. The theoretical underpinnings of this investigation are situated in Complex Systems theory (Davis and Sumara, 2006; Haggis, 2008) and Connectivism (Siemens, 2005). In contrast, Project Based Learning (Savery, 2015), Activity Learning Theory (Engeström, 2001), and Design Thinking (Brown, 2008) are considered yet discarded since they are not geared towards explaining Internet comprehension in SOLE.

Then, group work for reading enterprises is reviewed through the vast literature in Peer Collaboration (Dillenbourg *et al.*, 1996) and Cooperation (Johnson and Johnson, 2014). This is done under three distinctive epistemologies: group work from a behaviourist perspective, constructivist perspective and a modern group work related to the Internet. Then, in light of this review and the lack of a modern definition of reading comprehension, a definition is proposed to encompass online and offline elements to serve the purposes of this thesis work, followed by a literature review of reading in groups. After this review, SOLE is positioned in the context of education through Complex Systems Theory and Connectivism. The SOLE literature favouring and criticizing it is finally reviewed.

It should be made clear that despite the great theoretical underpinnings adopted in this thesis, reading from the Internet is an activity that researchers are still trying to define. Although outside the scope of this thesis, I favour a definition encompassing comprehension of Internet information, where one small aspect is the act of conventional reading. As it would be described in further sections, reading is influenced by other aspects of the Internet such as videos, images, comments, etc. Then the act of reading should be envisioned more as a nested system (Davis and Sumara, 2006) rather than an action for comprehension. This thesis is a step into the departure from reading in conventional terms to comprehension of the information found on the Internet.

2.2 Complexity Theory and Connectivism

Complexity Theory (Davis and Sumara, 2006) and Connectivism (Siemens, 2005) are distinctive yet intertwined. In the introduction of technology in the classroom, Complexity theory has migrated from the natural sciences and adapted to explain the intricacies of non-linear interactions and relationships created by a paradigm shift in education (Lemke, 1997). As researchers have indicated in recent years, theories of education such as Behaviourism, Cognitivism and Constructivism have become insufficient to explain the phenomenon of technology in the classroom and elsewhere (Siemens, 2005; Davis, 2008), hence the emergence of other theories.

Complexity Theory and Connectivism have been used in education to describe complex phenomenon: in the classroom (Levenson, 2014; Young, 2016), in the relationship between tutors and students (De Laat and Lally, 2003), in online environments (De Waard *et al.*, 2011) and elsewhere. They are unconcerned with why interactions happen but rather how they happen. For instance, Connectivism seeks to uncover nodes of knowledge interactions at the neural, conceptual and external level (Siemens, 2008; AlDahdouh *et al.*, 2015). It conceives knowledge as a network based on new technological advances and the capacity of humans to connect and interact with each other. These theories are presented here seeking to create a strong theoretical framework for the explanation of Self-Organized Learning Environment (Mitra, 2014b).

2.2.1 Complexity Theory

Complexity Theory studies complex systems of interaction, their connectivity, adaptability and evolution (Davis and Sumara, 2006). It looks at phenomena from a holistic, organic and open-minded perspective, replacing linear and cause-effect driven approaches. It is unconcerned with the parts of the system or its organisms in isolation (Morrison, 2006) and it is focused on systems.

Complexity Theory emphasizes how systems strive for survival. This adaptability and evolution creates constant change that is difficult to measure as the phenomenon of study begins and ends spontaneously (Davis and Sumara, 2006). For this reason, authors recommend for the researcher to establish the limits of the studied phenomena

acknowledging that findings, although valuable and valid, are not representative of the entire but a part of the phenomenon.

This theory defines systems as the collective of connected organisms and its environment (Morrison, 2006). Systems are characterised as: self-organised, bottom-up emergent, involving short-range relationships, nested structures, ambiguously bounded, organizationally closed, structure determined, and far from equilibrium. These, among other characteristics, speak of the complexity of the system yet its initial parts are simple: organisms governed by simple rules.

Complexity theory does not abide by deterministic realities or those socially constructed. It includes both views as needed: observed systems can be stable and observable, then disturbed as they interact with the environment (Davis and Sumara, 2006). This pragmatic view understands truth in terms of adequacy instead of optimality. For systems to survive, there is a need for self-organisation. This refers to the ability of the system to self-evolve (i.e. autocatalysis) when its parts are engaged or connected (i.e. autopoiesis) (Morrison, 2008). Respectively, higher levels of complexity are reached through feedback, recursion, perturbance, autocatalysis, connectedness and self- organization as the system evolves. However, Davis and Sumara (2006) warn that for self-organisation to occur, organisms need to be able to connect, cooperate and compete. Under these conditions, the system self-organises and a new order emerges (Davis and Sumara, 2006; Morrison, 2008). According to Mason (2008):

> Complexity Theory's notion of emergence implies that, given a significant degree of complexity in a particular environment, or critical mass, new properties and behaviours emerge that are not contained in the essence of the constituent elements, nor can be predicted from a knowledge of initial conditions. (p. 36)

This new order takes place because of the lack of external control and in the face of a random factor that the system is to overcome. This random factor is known in the natural sciences as an Attractor, since it instigates self-organisation but does not make it happen. Then, emergence only occurs when the system self-organises (Morrison, 2008). However, for a system to achieve self-organisation, its parts must connect in the face of chaos and maintain a strong connection but decentralise control over each other. In the edge of chaos, that is, between chaos and order, is where the system thrives, where its most creative and rich state resides (Morrison, 2008), therefore, for the system to

overpass this challenge, the system has to survive in this edge of chaos long enough to overcome its difficulties, its challenges. For this reason, lack of control (e.g. Teacher intervention, imposed rules to elicit order, and teacher selected information) allows the system to thrive, to live long enough at the edge of chaos to self-organise.

Regarding learning and learners, traditional concepts are challenged in Complexity Theory as well. For instance, Mitra (2014b) argued that one does not make learning happen, but lets it happen. This refers to the traditional role of the adults in instructing students in the different areas of knowledge. Complexity theorists argue that for the system to self-organise, traditional power control measures are to be rendered:

> Connectedness requires a *distributed knowledge* system, in which knowledge is not centrally located in a command and control centre. Rather, it is dispersed, shared and circulated throughout the system: communication and collaboration are key elements of Complexity Theory. (Morrison, 2008, p. 18)

In this sense, Complexity Theory defines the learner as "A complex unit that is capable of adapting itself to the sorts of new diverse circumstance that an active agent is likely to encounter in a dynamic world" (Davis and Sumara, 2006, p. 14), This new perspective speaks of a learner that is affected and then reactive to his/her environment for learning. This adaptation is what allows the learner to learn.

Finally, Complexity Theory asserts that the outcome of a self-organised system is unpredictable (Morrison, 2008). That is, depending on its organisms, the system evolves according to the positive/negative feedback, recursion, perturbance, and autocatalysis generated by the system during the process of self-organisation. This dependence on the organisms or initial conditions of the system makes the outcome measure unpredictable.

Complexity Theory studies systems that strive for survival. In this thesis, the organisms are young students connected to the Internet as they strive to answer a big question using collective knowledge for reading enterprises. As adult control is removed in SOLE, self-organisation occurs, and the emergent phenomenon is learning (Mitra, 2014b).

2.2.2 Connectivism

Upon the introduction of technology in everyday life, Connectivism redefined the concepts of learning and knowledge. Pioneered by Siemens (2005), Connectivism

integrates principles from Chaos, Network, Complexity and Self-organisation theories while arguing that more traditional theories of education (i.e. Behaviourism, Cognitivism and Constructivism) are insufficient to explain new learning phenomenon (Siemens, 2006a).

Connectivism is a learning theory that centres in three main assumptions and believes: knowledge and learning is a network of connections; knowledge and learning reside inside and outside the individual; and knowledge is distributed (Siemens, 2005). In other words, Connectivism's states that knowledge and learning are ever-evolving networks of interactions between and within individuals at the internal (i.e. neural and conceptual level) and external levels (e.g. networks formed in interactions with others and objects such as the Internet) (AlDahdouh *et al.*, 2015). For this, Siemens (2005) proposes a new definition of learning:

> Learning is a process that occurs within nebulous environments of shifting core elements – not entirely under the control of the individual. Learning (defined as actionable knowledge) can reside outside of ourselves (within an organization or a database), is focused on connecting specialized information sets, and the connections that enable us to learn more are more important than our current state of knowing (p. 5).

Then, knowledge is a distributed network and learning is the navigation and connections formed within networks (Downes, 2012). In this sense, Connectivism shares features of Constructivism and even Cognitivism in the fact that learning implies a construction of knowledge. However, Connectivism argues that knowledge and learning are not only bound to the constrains of language, but knowledge is distributed and even constructed outside language. Connectivism denies that knowledge can be created, represented or constructed in the individual since individuals can only access a portion of this knowledge, then, knowledge can reside inside and outside the individual. Downs (2012) further argues that "…knowledge can be produced by networks" (p. 32), and therefore, knowledge and learning are network bound. In this sense, Connectivism provides eight basic principles of learning (Siemens, 2005):

- "Learning and knowledge rest in diversity of opinions.
- Learning is a process of connecting specialized nodes or information sources.
- Learning may reside in non-human appliances.
- Capacity to know more is more critical than what is currently known.
- Nurturing and maintaining connections is needed to facilitate continual learning.

- Ability to see connections between fields, ideas, and concepts is a core skill.
- Currency (accurate, up-to-date knowledge) is the intent of all Connectivist learning activities.
- Decision-making is itself a learning process. Choosing what to learn and the meaning of incoming information is seen through the lens of a shifting reality. While there is a right answer now, it may be wrong tomorrow due to alterations in the information climate affecting the decision." (p. 5)

Furthermore, Downes (2006) enlists five major implications aligned with the new understanding of knowledge:

- Knowledge is sub-symbolic (i.e. knowing words does not mean that there is knowledge)
- Knowledge is distributed
- Knowledge is interconnected
- Knowledge is personal
- Knowledge is an emergent phenomenon

This new view of learning and knowledge clearly decentralizes the individual as the learner and it transforms it into a complex system that only forms in the interaction of the subject with the internal and external holders of information (Downes, 2012). Then, the focus of learning in school switches from content of information to how the network of learners navigates these vast networks of information.

These important networks of interaction are not only possible but needed because of the current abundance flow of information, impossible to contain in one single individual (Siemens, 2006b). Networks are defined as "…connections between entities." (Siemens, 2005, p. 4), where entities can be at the neural, ideas and institutional levels. AlDahdouh et al. (2015) created a network typology to explain this distributed networks of knowledge with its focus in the nodes and their relationships formed in interaction. The node in this typology "refers to any objects that can be connected" (AlDahdouh *et al.*, 2015, p. 4). Nodes come in three forms: neural (i.e. neurons and dendrites), conceptual (i.e. connected thoughts, ideas and concepts), and external (i.e. people, books, websites, programs and databases connected through the Internet or face-to-face relationships). Relationships refer to the links between the nodes of interaction and they have four characteristics: graded or interpreted, direction, self-joined or connected to itself, and patterned if the relationship is composed of two or more inseparable nodes.

Finally, AlDahdouh et al.(2015) agrees with Siemens (2005) that knowledge is a moving time-bound process. The speed of knowledge discovery in the world after the implementation of the Internet has created a learning reality that is dependent on time of accessed knowledge. To this extend, Siemens (2005) states that, “While there is a right answer now, it may be wrong tomorrow due to alterations in the information climate affecting the decision" (p. 4). Then knowledge depends on emergence, volatility and autonomy: nodes of knowledge weaken or strengthen according to these characteristics.

In brief, Connectivism explains a new way of learning while describing knowledge from a network perspective. It decentralises learning and knowledge from the individual to communities and appliances and knowledge as a distributed phenomenon. Learning and knowledge are network bound, hence the need to understand how networks form at the node levels in space and time (i.e. context).

2.3 Other theories of explanation

The following theories were considered for this study; however, they were discarded as they did not provide the appropriate framework to explain the SOLE phenomenon. This is presented next.

2.3.1 Problem Based Learning

Pioneered in the medical field, Problem Based Learning (PBL) has been extensively used in primary and secondary education for over 30 years (Savery, 2015). PBL is a learning theory based on Constructivist principles. It advocates for the construction of knowledge by solving problems in collaborative communities in real contexts. Savery (2015) defines PBL as “…an instructional (and curricular) learner-centered approach that empowers learners to conduct research, integrate theory and practice, and apply knowledge and skills to develop a viable solution to a defined problem.” (p. 12).

In explaining the main characteristics of PBL, Savery (2015) points to the role of the learner as self-directed and self-regulated, the role of the teacher as a facilitator and mentor, and “…the essential elements in the design of ill-structured instructional problems as the driving force for inquiry.” (p. 15). In this approach, the learner takes a centred role in solving a chosen problem, hence the five goals of PBL which, “include helping students develop 1) flexible knowledge, 2) effective problem-solving skills, 3) effective self-directed learning skills, 4) effective collaboration skills, and 5) intrinsic

motivation." (Hmelo-Silver and Eberbach, 2012, p. 3). These goals are presumed to allow the learner to overcome the given problem.

The role of the teacher varies in PBL (Hmelo-Silver *et al.*, 2007; Hmelo-Silver and Eberbach, 2012). Depending on the stage of the enquiry, teachers model, facilitate or mentor. They ensure that the learners understand the skills needed to solve problems and therefore they constantly model and support them. Teachers also mentor students when they cannot pass a difficulty in any stage of the project. Finally, they ensure the environment for students to solve the enquiry: they facilitate materials and learning. In other words, teachers are constantly assessing the situations in which students confront the problems while determining student progress. This information then become vital for the roles of the PBL teacher.

Regarding the ill-defined problem, as Savery (2015) calls it, has different characteristics. The problem must be of the students' interest, complex, and open-ended. In this way, the problem will elicit all the skills and abilities as set in PBL goals. For instance, an ill-defined problem will require of students to collaborate while using information from different disciplines to solve. The roles of students, teachers and ill-defined problem are centred around the idea that the learner will construct his/her own knowledge and in this exercise, the goals of PBL are met.

Research in PBL has shown conflicting results. First, it is argued that PBL has restricted research evidence to claim definite results regarding its effectiveness (Kirschner *et al.*, 2006; Hmelo-Silver *et al.*, 2007). Second, PBL has limited empirical evidence in K-12 student education but few study show favourable results (Achilles and Hoover, 1996; Wirkala and Kuhn, 2011). Third, results of studies found in the literature are either conflicting or inconclusive (Colliver, 2000; Masek and Yamin, 2011). However, several authors argue that despite the lack of research validity, PBL is a learning approach that fosters students' curiosity, engagement and metacognitive skills.

The principles and elements proposed in PBL are seemly related to SOLE: the role of the teacher, the role of the learner and the basis of learning in the solution of a problem and/or question. However, PBL's view of learning and knowledge is founded in the construction of knowledge through language residing in the minds of the individuals (Savery, 2015), while SOLE is best explained through the networks of information

formed between learners, appliances and entities, making PBL an unfit tool to explain SOLE.

2.3.2 Activity theory

Originating in the writings of Vygotsky (1978) and his social constructivism, Activity theory is

> "…an approach in psychology and other social sciences that aims to understand individual human beings, as well as the social entities they compose, in their natural everyday life circumstances, through an analysis of the genesis, structure, and processes of their activities." (Kaptelinin and Nardi, 2006, p. 31)

Activity Theory focuses on the study of activity, that is, the interaction between subject and object (Engeström, 1999; Kaptelinin and Nardi, 2006). The object of study, activity, is defined as "…process in which mutual transformations between the poles of ''subject–object'' are accomplished" (Kaptelinin and Nardi, 2006, p. 31). Then, since the unit of study is activity, subject and object cannot exist outside the activity and it is in activity where developmental changes happen in the subject. Invariably, this changes the view of cause-effect relationships to how the activity influences the subject and object. Engestrom (2001) advocates for the analysis of activity as a unit instead of the analysis of its individual parts: subject and object.

Activity theory recognises and explains the dichotomies produced by the switch from the study of the individual (e.g. Cognitivism, Constructivism) to the study of how the individual and the object interact in a collective effort. Engestrom (2001) used these dichotomies to develop the five principles of Activity Theory. First principle states that the unit of analysis is the systems activity formed by collective subject-object interactions with artefacts. He further explains that although this system activity is the focus of the study, the interaction of the original system activity with other systems is also considered in the analysis. In other words, Engestrom (2001) brings attention to a complex view of how activities not only originate in social interaction with individuals and objects, but how they influence, are influenced and connected to other systems.

Second principle is the recognition of multi-voicedness present in the systems activity. Activity Theory recognises that all the entities forming the system activity produce multiple and multiplied opinions, traditions, and cultural believes that at the same time interact with other systems activities. Third principle is historicity: activity occurs in specific time and space that needs to be taken into consideration. That is, to understand

an activity, one is to study the basis of its history at the individual and network level. Only then, a true picture of the activity will reveal itself.

Fourth principle is contradictions since this provokes change and development of the activity system. Engestrom (2001) makes the clear distinction that contradictions rather than problems and conflict produce development. That is, contradictions generate a disturbance in the system that elicits change and development. Finally, is the principal of learning expansion by the transformation of the activity due to resolved contradictions. In other words, as contradictions permeate an activity, individuals and later collectives develop to transform the activity that was initially in contradiction with its subjects and objects. In this development, learning is expanded, and new histories and interactions are formed with the new obtained information.

Engestrom (2001) uses these five principles to answer questions about learning, learner and knowledge and calls it Expansive Learning. In this Expansive Learning, the concept of learner in Activity Theory goes beyond the subject, to the multi-voicedness, histories, and contradictions of the subjects, tools and systems that expand in cycles as they are motivated to interact. For Activity Theory, learning is the expansion of knowledge and ideas developed in activity.

Activity Theory, according to Engestrom (2001) has evolved from Vygotsky's (1978) introduction of the idea of "cultural-mediation" in which culture affects the individual; to Leont'ev (1981) new proposed focus of study from the individual's actions to collective activity, until the introduction of activity from a cultural-historical approach (Engestrom, 1987). In this progression from the individual to the collective to the cultural-historical, Activity Theory has transformed itself into a more complex theory for the study of current subject-computer activities.

The present study is interested in investigating the complex phenomenon of information comprehension as an emerging phenomenon provoked in the interactions between young students and the Internet. The focus and scope of this study is not the cultural and political implication of group work. Although Activity Theory attends to collective learning and distributed knowledge (Engestrom, 1987) as is the case of SOLE, it does not account for emergent comprehension but for expansive comprehension in relation to cultural-historical activity. Therefore, this theory was considered to explain SOLE, yet discarded.

2.3.3 Design Thinking

Design Thinking was initiated outside the educational field when IDEO -overwhelmed by the constant requests to redesign, improve or design products for complex social problems- use the term Design Thinking to refer to the solutions of social problems with a designers perspective mind (Brown and Wyatt, 2010). Brown (2008) defined Design Thinking as "…a discipline that uses the designer's sensibility and methods to match people's needs with what is technologically feasible and what a viable business strategy can convert into customer value and market opportunity" (p. 2).

Design Thinking has now evolved and permeated the walls of education. As other educational approaches (Savery, 2015), it starts with the solution of a problem or something that needs improvement (Koh *et al.*, 2015), sometimes in the form of an object and some other times in the form of an organization, a theory or a pedagogy. For this, Design Thinking defines four parts of a process: empathize, define, ideate, prototype, and test. What sets Design Thinking apart from design is that it is human-centred (Brown and Wyatt, 2010; Koh *et al.*, 2015) and therefore it conceives the problem to solve from the sensibilities of the social community involved in the problem.

Design Thinking is a mindset (Brown, 2008) where the limits of interdisciplinary collaboration have to disappear in order to develop solutions that will suit the needs of the people involved. Then, Brown (2008) describes the qualities of the professionals involved in Design Thinking: empathy, integrative thinking, optimism, experimentalism and collaboration. Furthermore, Serrat (2017) explains that the main premise of Design Thinking is that is human-centred; it revolves around understanding groups of people and what they want and do not want. Therefore, Design Thinking requires an abductive process where the mind is clear of preconceived notions to offer a solution to a persistent problem.

Koh et al. (2015) explains how Design Thinking for education has developed an epistemology with a shift from knowing before creating and the importance of "…knowledge as a verified truth" (p. 9), to an epistemology of creativity despite of acquired knowledge and knowledge as an ever-evolving subject for which the subject needs to adapt. In this sense, Design Thinking in education advocates for the identification of the so-called wicked problem stemming from students, schools and other related organisations, in which the people for whom problems are identified

become the solvers and the solutions. In this sense, Design Thinking is an approach centred in the important problems of education as defined by the people inside those problems.

Design Thinking and SOLE share the initial understanding that students are to solve problems/questions as a challenge that will most likely lead to learning. However, Design Thinking is focused on the solutions of such problems and the process involved in the solution, while the current study of information comprehension in SOLE focuses on explaining how this phenomenon happens in the creation of a complex system to allow comprehension to happen. For this reason, SOLE is best explained by Complexity Theory (Davis and Sumara, 2006) and Connectivism (Siemens, 2005) than a design paradigm.

2.4 Group work

Group work in education has been investigated extensively from diverse perspectives. According to the development of epistemologies, theories and paradigms, group work has evolved and adopted different theoretical frameworks (Dillenbourg *et al.*, 1996). More recently, facilitated by technology, it has been studied from the perspective of online participation in face-to-face or distance collaboration (Stahl *et al.*, 2006). The present review will first explain the parameters in which group work is delineated in the educational arena, explain its evolution, provide understanding of its most recent findings to finally expose group work in the context of reading instruction.

Group work in education has been defined under two separate and sometimes interchangeably terms: Peer collaboration and peer cooperation (Panitz, 1999; Zimmerman, 1999). This distinction although important to the understanding of group work, needs to also be seen as the flow of the style of interaction when children work together; that is, in one group work situation, both types of interactions can emerge (Zimmerman, 1999). Damon and Phelps (1989) defined these two concepts in terms of educational applications. Peer collaboration is described as “a pair of relative novices working together to solve challenging learning tasks that neither can do on their own prior to the collaborative engagement” (p. 13). In this definition, sharing of ideas creates group cohesion, while exchange and acceptance leads the group to successful learning experiences. In contrast, cooperative learning is a team-based approach in which the workload is divided among members to reach a common goal (Damon and

Phelps, 1989; Zimmerman, 1999). In peer collaboration, interaction is based on the willingness and responsibility of individuals within the group while cooperation is based on the contribution of the individual to the group.

2.4.1 Evolution of collaborative learning

Group work has been approached from Behaviourism, Constructivism, Social Development, and most recently collaboration in computer mediated situations (Dillenbourg *et al.*, 1996; Blatchford *et al.*, 2003; De Laat and Lally, 2003; Siemens, 2005), hence the constantly evolving focus of study. Influenced by behaviourist views, the first investigations measured the effects of group work on student individual skills such as problem solving (Rojas-Drummond and Mercer, 2003), planning and execution of ideas and building with accuracy (Azmitia, 1988).

Around 1995, based on Vygotsky's (1978) theory of social interaction for knowledge gain, research concentrated on the dynamics and mechanisms of social activity enabling or discouraging learning in relation to compatibility of group work (Webb, 1989), (Gauvain and Rogoff, 1989), students' verbal interactions (Teasley, 1995; Baker, 1999; Wegerif *et al.*, 1999; Rojas-Drummond and Mercer, 2003), and influence of teacher on group interactions (Cohen, 1994). These studies shed a new light into the importance of appropriately paring students, quality of activities and teacher training as scaffolds for successful interactions. For instance, in a study by Wegerif et al. (1999) students were taught the use of Exploratory Talk (i.e. engaging in critical and constructive conversation as a means to facilitate academic and social gains). The study concluded that Exploratory Talk increased individual problem-solving abilities. This and other studies brought attention to the influence of environment, activity and subjects on collaborative interactions.

A second reoccurring theme of this period was the influence of teacher-student interactions in the quality of collaboration. For instance, Rojas-Drummond and Mercer (2003), found that students who were explicitly taught how to use Exploratory Talk during group work improved communication and collaboration skills. In a similar way, Stevens et al. (1991) demonstrated student individual and group gains when direct teacher instruction was offered prior to group work.

Perhaps the most distinguished figures of this period, Johnson and Johnson (1999) explored cooperative learning from the social perspective. These authors appealed to the need for cooperative learning considering the achievement and socialization crises of the time. They delineated nine principles of cooperation: positive interdependence, individual accountability, heterogeneous groups, shared leadership, shared responsibility, emphasis in task and maintenance, direct teaching of social skills, teacher first observes and then intervenes, and groups evaluation of the effectiveness of their own processes of interaction (Johnson *et al.*, 1994). In their extensive line of research, Johnson and Johnson (2014) reviewed the concepts of individualistic, competitive and cooperative learning. They showed that in 685 studies conducted in the last 200 years, "Working together to achieve a common goal produces higher achievement and greater productivity than does working competitively or individualistically." (2014, p. 843). They added that in cooperative learning students achieve higher-order thinking skills such as critical thinking and problem-solving. In brief, the extensive research by Johnson and Johnson (1994, 2014) on cooperative learning showed the benefits and need for group work as a means of improving academic and social abilities.

A new shift has occurred by developments in technology and new paradigms for group work are emerging (Scardamalia and Bereiter, 2006; Stahl *et al.*, 2006). Access to information and connectivity with online users in addition to the introduction of technology in the classroom have provoked new forms of collaboration (Lipponen, 2002; Siemens, 2005; Downes, 2012; AlDahdouh *et al.*, 2015) and a different understanding of learning (Davis and Sumara, 2006; Scardamalia and Bereiter, 2006; Siemens, 2006b; Siemens, 2008). Hence the emergence of new focuses of study: aspects such as collaborative knowledge building, group and individual perspectives, mediation by artefacts (Stahl, 2002), network formation and navigation, and distributed knowledge (Siemens, 2008; Downes, 2012) are some clear examples of this.

A new definition of learning has also emerged: previously perceived as a transactional activity, now learning is defined from collective social experiences (Scardamalia and Bereiter, 2006), the ability of individuals to connect with other individuals and artefacts and the way knowledge travels between individuals and devices which allows learning to emerge (Siemens, 2006b). Instruments of connectivity (e.g. Internet and software) and knowledge acquisition are now essential key players. This is explained in

Liponnen's (2002) definition of Computer-Supported Collaborative Learning (CSCL) as "how collaborative learning supported by technology can enhance peer interaction and work in groups, and how collaboration and technology facilitate sharing and distributing of knowledge and expertise among community members" (p. 1). Observed closely, a shift is noticed from the individual or the nature of the group's interaction, to a view that acknowledges a connected system inclusive of individuals and artefacts where context (i.e. place for interactions) is integrated in the understanding of group work. However, earlier studies in CSCL insisted in the use of Constructivist and social theories for the explanation of CSCL (Lipponen, 2002), then to be cautiously challenged by authors such as Dillenbourg et al. (1996) who used distributed cognition as a new tool for exploring group work. In this attempt, they mentioned the difficulty of the social scientist to accept the group rather than the individual as a single cognitive system. Inevitably, new paradigms for group work have emerged.

For Dillenbourg and colleagues (Dillenbourg *et al.*, 1996; Dillenbourg, 2013) the challenge of technology in the classroom was taken from the perspective of improving as opposed to changing the classroom. For this, they explain the role of the teachers as the orchestrator of activities in the classroom. Orchestration in Dillenbourg et al. (2013) terms, refers to "…how a teacher manages, in real time, multi-layered activities in a multi-constraints context" (p.1). Furthermore, Dillenbourg (2011) explains the context of the classroom into three circles of understanding: how individuals interact with technology, how tools affect team collaboration and how the classroom functions as a user. This last circle is what the authors refer as orchestration, which aim is to understand how technology can improve existing processes.

Other authors such Siemens (2008) and Davis and Sumara (2006) are proposing new theories of explanation from the perspective of networks and complex systems, discussed in Chapter 3. Studies of this nature are focused on explaining collaborative learning in online face-to-face and asynchronous interactions. For instance, Poutanen et al. (2011) used complex systems for the study of a blended learning university course, in which students participated in face-to-face and online environments for lectures and discussions. Similarly, Levenson (2014) studied how in a mathematical classroom, teachers can set up the conditions for a complex system where the emergent phenomenon is mathematical creativity, without a teacher direct and explicit intervention but by setting up the environment for this to happen. Finally, De Laat and

Lally (2003) studied the interactions of students in tutoring and online collaborative learning situations. These authors identified these interactions between students in both situations as complex systems and therefore proposed the need for a multi-method approach for the explanation of a phenomenon.

The study of collaborative learning has experienced multiple transformations related to theories of explanations, shifts on paradigms and most recently the introduction of technologies into the classroom. The study of collaborative learning has also gained a new status because of our most recent ability to interact face-to-face as well as online. Technology and connectivity have allowed for the most rapid experience of knowledge creation humans have ever experienced, producing a new need to distribute our efforts to continue expanding our knowledge. It is under this landscape that Self-Organized Learning Environments (SOLE) situates itself, as a 21st century ready approach to learning.

2.4.2 Collaborative learning for reading enterprises

In order to understand reading in collaborative settings, first reading comprehension needs to be defined. However, in the current state of reading a definition is being created to include our new understandings of online activity. Therefore, this thesis work adopts the accepted definition of reading, which has been delineated for offline reading environments, while including a more recent proposal. After this, a review of the literature of collaborative online reading will be exposed here to finally situate SOLE and its study in the context of research.

2.4.2.1 A definition of reading

A definition of reading comprehension is as elusive as the act of comprehending. Reading has morphed over time to reflect the historical tendencies, advances and policy reform in education (Pearson, 2014). It has been described in behavioural, cognitive and constructivist terms (Ertmer and Newby, 1993), and in more recent years, it has evolved to include new tendencies in computer literacy and online reading enterprises (Coiro, 2014). Reading is a dynamic construct influenced by sociocultural and political changes and expectations.

Influence by constructivist views, The RAND Reading Study Group (2001) defines reading as “the process of simultaneously extracting and constructing meaning through

interaction and involvement with written language" (p. 11). However, cautioning the importance and insufficiency of the text, authors explain that it is the job of the reader to extract and construct meaning based on the reader's abilities, implying that text interpretation depends on reader, activity, and context. This definition of reading encompasses three concepts: the reader, the text and the activity in which reading occurs, while these three concepts are influenced by the sociocultural context (See Figure 2.1). However, with the insertion of the Internet in everyday life, the work place, the classroom and other contexts, a new definition is emerging to include the constant changes in the understanding of literacy (Kiili et al., 2009; Leu et al., 2017).

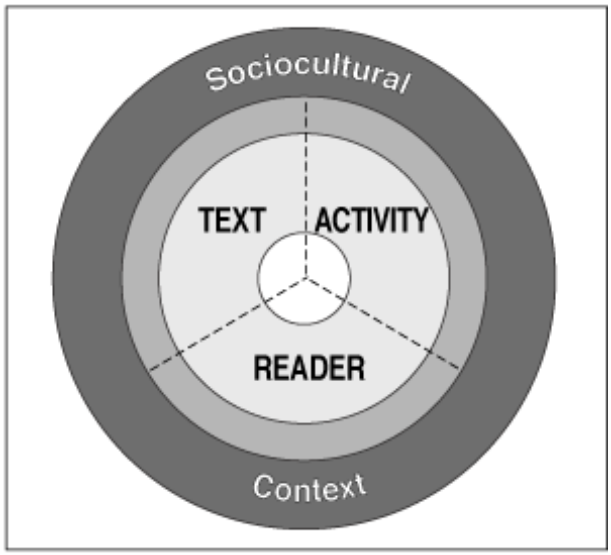


Figure 2.1 A heuristic for thinking about reading comprehension (RAND Reading Study Group, 2001)

New Literacies (uppercase) and new literacies (lowercase) is a recently proposed solution to track the changing landscape of literacy (Leu *et al.*, 2017). Lowercase new literacies refer to all research areas exploring emergent literacies and technologies. In this way, new literacies allow for the rapid track of new theories, discoveries and approaches to literacy. In contrast, uppercase New Literacies track the common findings of the multiple new literacies in order to determine patters and commonalities. This enables new literacies to maintain their perspective while keeping track of the fast-changing landscape in literacy. In the face of upper and lowercase new literacies, online reading is defined from the two components of online activity: research and comprehension. Online research and comprehension encompasses some of the features of the definition of offline reading to then include complex new features. For this, online research and comprehension become a better term when referring to online work, which is defined as follows:

> "The new literacies of online research and comprehension include the skills, strategies, dispositions, and social practices necessary to successfully use and adapt to the rapidly changing information and communication technologies and contexts that continuously emerge and influence all areas of our personal and professional lives. Online research and comprehension is a self-directed process of constructing texts and knowledge while engaged in several online reading practices: identifying important problems, locating information, critically evaluating information, synthesizing information, and communicating information. Online research and comprehension can take place individually, but often appears to be enhanced when it takes place collaboratively" (Leu *et al.*, 2017, p. 7)

In this study, reader is defined as an individual and/or group of students who read together to extract and construct meaning from offline texts and in online research to solve questions, in which participants contribute with their own cognitive abilities, motivation, knowledge, experiences and ability to collaborate. The group negotiates text/information meaning to comprehend, making comprehension dependent upon reader, text, shape of the activity, context, time and space in which the activity happens. For the purposes of this study, the reader was defined as a group of fourth-graders of New York City sometimes reading together and sometimes alone, where meaning emerges when these groups engage in collaboration.

The RRSG (2001) points out that text features impact comprehension in different ways. Text in this study referred sometimes to printed passages (i.e. offline texts) and other times to texts found online as the reader navigates the Internet (i.e. online texts). Offline texts were limited to those provided in the study while online texts were of the participants' choice. Then, text features ranged from the common features found in offline informational texts (e.g. headings, bold words, captions, and illustrations) to the vast features of texts found online (e.g. hyperlinks in addition to all the above) when readers conducted research. These differentiated features impacted reading by changing how readers approach the act of reading.

Activity consists of three components: purpose, operations and outcomes (RAND Reading Study Group, 2002). In this study, activities were the two research conditions of participation: reading individually offline texts and reading in groups offline texts and on the Internet for answering questions. Finally, the context in this study refers to two different situations: first, two classrooms in New York City that were adult supervised but unaided. That is, the adult ensured participants' safety, but she refrained from providing instruction, intervention or support. The second context was the Internet, in which reading is intertwined with other features beyond text, such as videos,

images, hyperlinks, personal accounts and explanations of texts, and distractors such as advertisement, offers of social media links and many other features influencing the context to be navigated and comprehended by the reader. In brief, reading comprehension in this study depended upon reader, text, activity, sociocultural and Internet contexts. Participants navigated individually and in groups through offline and the Internet to answer questions.

2.4.2.2 Reading in peer-mediated settings

In the research review of peer collaboration for reading activities, it is important to mark the distinction between reading offline as opposed to reading in online settings, since the definitions between these two activities clearly expose substantial differences. In this review, studies geared towards collaboration in offline reading activities are presented first, then studies that include collaboration in new literacies settings are discussed.

Influence by constructivist and social theories (Pearson, 2014), peer collaboration for offline reading has shown to support improvement of student's reading abilities, and a variety of programs are found in the literature (Murphy *et al.*, 2009). For instance, Palinscar and Brown (1984) developed a reading program in which the teacher uses questions and teaches reading strategies to prepare students for group reading. Similarly, Rojas-Drummond and colleagues (Rojas-Drummond and Mercer, 2003; Rojas-Drummond *et al.*, 2008; Rojas-Drummond *et al.*, 2014) found that students improved reading skills as a consequence of teacher direct instruction and collaborative group reading. This and other similar programs have proven effective, and a proliferation of research in this area is observed in the last 30 years.

Research in group reading activities has brought attention to the careful selection of materials such as books and reading comprehension questions (Stevens *et al.*, 1991; Rojas-Drummond *et al.*, 1998; Trickey and Topping, 2004; Castek *et al.*, 2012; Henry *et al.*, 2012). For example, some studies have used questions as leading prompts to elicit reading comprehension in students, while others believe books, computer software, and the Internet are important elements to consider in group reading. Nonetheless, these studies have failed to report the actual influence of these materials on student collaboration and academic achievement.

A short but important list of studies has focused on the impact of reading at different text complexity levels. Morgan, Wilcox, and Eldredge (2000) studied the level of complexity that would benefit struggling readers the most when reading with a more capable peer during dyad situations. Readers were first trained on how to collaborate, then for 95 hours of a school year, they read in dyads under one of three conditions: reading at instructional reading level, reading two grades above instructional reading level, and reading four grades above their instructional reading level. The results showed that while reading in dyads, poor readers scored better in reading scores in standardised tests when texts were two grade levels above the reader's abilities as opposed to when texts were much higher than two grade reading levels or at grade level. Although this practice is not commonly used in the practice of reading, McNamara et al. (2011), found that increased text cohesion (i.e. explicit cues to make a text more readable) had adverse effects on skilled readers because readers with well-structured prior knowledge need a more flexible text to form appropriate idea units, in individual reading situations.

The most common scaffold in the research of group reading activities is the teacher as a guide for learning and understanding (Stevens *et al.*, 1991; Rojas-Drummond and Mercer, 2003; Rojas-Drummond *et al.*, 2014). However, research in student autonomy has indicated that teacher behaviours correlate to students' feelings of autonomy (Reeve, 2002; Reeve and Jang, 2006). These studies consistently show that teachers who allowed students to work at their own pace, praised as informational feedback, offered encouragement, offered hints when stuck, responded to student generated questions, allowed students to talk and communicated perspective-taking statements were perceived as autonomy supporters. The authors argued that although teachers could not give students a sense of autonomy, they provide the environment for students to experience it.

Reading has substantially changed with the Introduction of the Internet on everyday life, the workforce and school. A definition of reading is only an aspect of the New Literacies enabling comprehension of Internet material (Leu *et al.*, 2017). That is, as the reader performs research in the Internet, he/she or them encounter different material (i.e. printed, audio-visual, etc.) and it is in the integration of all these resources by the individual or the group where comprehension is enabled.

In the search for the understanding of reading in online situations, Coiro and colleagues (Coiro and Dobler, 2007; Coiro, 2011; Castek *et al.*, 2012; Coiro, 2014) showed over the past 10 years that offline and online reading skills differ in sophistication and use of critical thinking skills. For instance, they demonstrated that limited prior knowledge does not affect comprehension in individual online reading practices as in individual offline reading situations: hyperlinks, videos, word definitions and other scaffolds weakens the need for prior knowledge in online reading. In contrast, online research requires the use of metacognitive abilities such as evaluative skills, critical thinking, problem solving to navigate the Internet, synthesize information, and digital wisdom to comprehend written and other accessed information (Kiili *et al.*, 2009; Leu *et al.*, 2014). Similarly, Henry et al. (2012) found that participation of students with learning disabilities in collaborative online reading projects was facilitated by natural online scaffolds (e.g. hypertexts, videos, images, etc.), making interactions and reading successful. In brief, evidence indicate that online reading provides natural scaffolds unfound in books while challenging the reader to use higher-order thinking skills.

Jackson and others (Jackson *et al.*, 2006; Jackson *et al.*, 2011) found that students who used the Internet at home more frequently had improved reading scores in standardized tests over students who did not use the Internet as frequently. The authors argued this was because frequent Internet users were reading more complex texts than less frequent users. This indicated possible benefits to presenting children with complex texts, challenging the well-established notion that young students need to be matched with books appropriate to their reading level.

Search and comprehension of the Internet have become two of the most important skills to succeed in school and work environments (Leu *et al.*, 2017). An Internet search can result in thousands of links in a very short time, and for young students this is a serious challenge. An emergent group of investigations are starting to provide solutions to this challenge by use of collaborative learning groups. For instance, Passig and Maidel-Kravetsky (2016) found that when student read information from the Internet in dyads, they were able to produce better writing summaries than when students read alone. Similarly, Kiili and collaborators (Kiili, 2013; Kiili *et al.*, 2016) found that in online group reading situations when provided with a few tools such as guides to summarize and critically think about Internet material or simple argument graphs, student collaboration was enabled while understanding of online material was enhanced and

even essay-writing improved. Furthermore, in a comparison of collaborative groups, Chen and Chen (2014) found that when collaboration is supported by the use of explicit scaffolds (i.e. collaborative reading tool), groups were able to comprehend better than groups that did not use this scaffold.

In the quest to understanding online reading, Castek et al. (2012) evaluated how seventh graders collaborated in solving a question using the Internet. In this study, four different skills were identified: locating, evaluating, synthesizing and communicating as the main skills used to comprehend what they read. Additionally, it was noted that students were able to construct meaning together with teacher scaffolds when students failed to use either of the four skills.

In brief, despite the clear departure from reading to online search and comprehension, collaborative groups have shown to support both enterprises. As the Internet poses a greater challenge important to address, collaborative groups gain a special place in the instruction of learning from the Internet, worth researching and exploring.

2.4.3 Critics of Group Work

Research in cooperative and collaborative learning has consistently shown the benefits of group work (Johnson and Johnson, 2002; Rojas-Drummond and Mercer, 2003; Rojas-Drummond *et al.*, 2008; Chu *et al.*, 2011; Chen and Chen, 2014; Passig and Maidel-Kravetsky, 2016). However, as in any educational approach, criticism -although limited in this case- is centred around the lack of research in areas such as gifted students (Robinson, 1990; Patrick *et al.*, 2005) and teacher difficulty in implementation of collaborative and cooperative activities (Gillies and Boyle, 2010). In other words, research in this area speaks of the assumptions that collaborative learning works for every student and for every teacher.

Although Patrick et al. (2005) refers to gifted students, they point to the fact that in heterogenous groups gifted students are slowed down by other peers. This brings questions to the appropriateness of collaborative learning for special populations: for instance, students in the Autism Spectrum Disorder are known for difficulty in socializing with peers (American Psychiatric Association, 2013), in cooperating and collaborating situations this may pose a challenge for these students. However, there is no evidence of studies explaining the impact of group work on special populations.

The second criticism of group work as an approach to learning is the different issues in its implementation. Gillies and Boyle (2010) capture the issues teachers explain in the implementation of collaborative learning. Teachers explained difficulty with student attention and focus on work, time management, time needed to set up collaborative activities, and student's lack of socialization skills for conflict resolution. However, teachers also spoke highly of collaborative learning and its benefits in academic gain and student socialization skills.

Collaborative learning represents a type of learning uncommon to some school routines. It represents a problem when instruction is teacher based, because the teacher is to change the mode of instruction to a more student centred one while rendering control of the students to the group. Therefore, provisions need to be made for teachers and students to be able to benefit from work group situations.

2.5 A modern approach to peer collaboration for Internet comprehension

As seen in the above review, research in reading comprehension points to a shift on focus. For this, Coiro (2014) and Kiili and colleagues (Kiili *et al.*, 2012; Kiili, 2013; Kiili *et al.*, 2016) recommend collaborative online reading as a vehicle to support Internet search and comprehension in young students. Similarly, Mitra (2014b) supported solving challenging questions in groups using the Internet in adult unaided environments to ease the challenge of information comprehension of Internet material while promoting learning in students.

The current study is founded on the concept of Self-Organised Learning Environment (SOLE), which refers to "...the adaptation of a school space to facilitate Enquiry Based Learning. A teacher encourages his/her class to work as a community to answer questions using computers with Internet access" (Mitra *et al.*, 2010). SOLE suggests special conditions in which learning is instigated through an academic challenge and children working in groups to solve this challenge. These conditions are applied to the current research study to determine the impact of this approach on the reading skills of fourth-grade level students of New York City while explaining how this process works.

If SOLE was to be positioned according to educational approaches, it should be placed at the far end of Enquiry Based Learning and opposite to teacher centred instruction. In SOLE, information is in the hands of the students as they navigate the Internet and the

teacher or adult is only to ensure safety and encouragement. Then in teacher centred approaches, teachers own the information and what s/he owns is what is given to the student, while the student plays the role of receiving the information. In this simple continuum of educational approaches, it is inferred that teachers and students move and shift according to the circumstances and the environment in which instruction takes place (Refer to figure 2.2). Therefore, the study of SOLE is from the perspective of Enquiry Based Learning, which encompasses problem-based learning, activity learning, group work, and design thinking. In SOLE students solve their own enquiries with minimal intervention from adults.

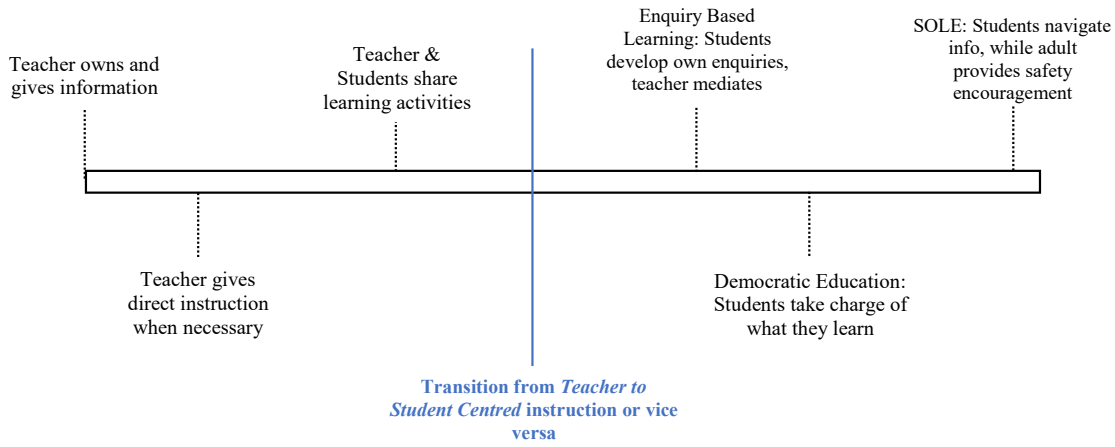


Figure 2.2 SOLE Positioning in Educational Approaches

The studies on SOLE must be understood under two different premises: some studies have been conducted in outdoor computer kiosks and others in indoor labs. The second premise is that for some groups of students, English is a native language while for others it is a language either introduced in schools or introduced in SOLE situations. Nonetheless, there seems to be a common thread holding these together: in SOLE, children self-organise for learning.

Studies about SOLE are scarce but promising. This stems from the specific conditions under which SOLE occurs: minimal adult intervention, student-centred learning, motivator outside the parameters of traditional education and at times, learning in public kiosks (Mitra *et al.*, 2005; Dangwal and Thounaojam, 2011; Mitra, 2014b; Mitra and Dangwal, 2017). Research reports student improvement in different academic areas (Mitra and Rana, 2001; Mitra and Dangwal, 2010), computer skills (Mitra and

Dangwal, 2017) and personal growth (Dangwal and Kapur, 2008; Dangwal and Kapur, 2009). Finally, SOLE has been implemented in over 110 countries and educators and learning enthusiasts recognize it as a successful practice.

Similar to findings in autonomy research (Reeve, 2002), SOLE studies identified the different student characteristics observed in computer kiosks leading to self-organised learning: social development, social networking, and openness to learn from others (Dangwal and Kapur, 2009). These findings are consistent with the research in peer collaboration and self-determination, which relies on student's interactions for the solution of challenges (Ryan and Deci, 2000).

The impact of SOLE on student reading comprehension skills has been researched even less. Inamdar (2004) reported students' passing scores of a computer literacy state examination by use of this teacher-unaided approach in outdoor computer kiosks. Similarly, Mitra and Dangwal (2010) reported that when groups of 10 to 14 year olds worked under SOLE conditions in computer kiosks with access to advanced academic material, they achieved test scores comparable to students who received traditional instruction in the classroom in the same academic area. Even if the focus of this study was not reading, it implies that students read complex material to achieve these test scores. Although preliminary, these findings bring attention to children's ability to negotiate meaning together in unsupervised Internet supported environments.

Mitra and Quiroga (2012) tested the reading comprehension competencies of 9 to 11-year-old students in classroom settings. Groups solved questions from an American reading test intended for older students using the Internet as a supporting tool. The study concluded that students were better at answering reading questions in groups than individually and that children scored best in higher-grade tests than lower grade-level tests. However, authors reported limitations due to a small sample size.

Despite research efforts, SOLE has not been studied enough and with the needed rigor to position itself in the scientific arena. In an exchange about Mitra's research publications, Arora (2010) described the lack of information in regards to methodology and procedures that could help solidify Mitra's findings, in addition to lack of scientific rigor and feasibility of scaling up computer kiosks around the world. Then, Mitra answered (Arora and Mitra, 2010) Arora's questions in regard to the romanticise idea of freeing students from the restrictions of schools by placing outdoor computer kiosks,

the need for teachers versus mediators, and remarks about vandalised computer kiosks. Similarly, Warschauer (2004) who visited some of Mitra's computer kiosks, exposed how these were poorly equipped with academic information and therefore students -as reported by families- dedicated most of the time to play games and drawing. Additionally, this author reports a lack of community involvement in the project, which made it difficult for villagers to understand the kiosks. This and other claims caused bloggers to criticize Mitra's work from idealistic claims such as the replacement of teachers by mediators, Google as a tool to achieve formal educational standards (e.g. using Google to become a medical doctor), and using SOLE as a panacea for second language acquisition, among others (Clark, 2013; Harmer, 2014).

Unfortunately, there is no evidence in the writings of these critics, any formal or informal attempt to practice and/or study SOLE. The only study of this kind was found in the investigation by Rix and McElwee (2016) who made use of a SOLE lab in England to research if students in secondary school who had scored the lowest in a state test were able to learn geography content through the SOLE approach. This action research showed that at first students were able to navigate pages in the Internet, however, after three SOLE sessions, students' progress towards solving the question was diminished. Authors speculated that this was due to students reading difficulties and therefore unwillingness to read lengthy Internet texts that could have led them to the answer. In response, peer-mediators of older age but without knowledge of specific geography content were introduced to SOLE sessions. This scaffold resulted in higher levels of comprehension and solving the question. Although this study brings light into how comprehension can be hindered by poor reading skills, the big question used in this study could have been too abstract for the age of the students, which is yet to be study in SOLE.

Investigations in SOLE are scarce, especially those addressing Internet comprehension, indicating a research gap. More studies are needed to determine if groups of children are able to self-organise to read complex text better than reading individually and to explain the mechanisms facilitating comprehension under these conditions.

2.5.1 Self-Organised Learning Environment and Complexity Theory

In the process of identifying a new approach to education that included the effective use of computers, in the early 2000s Prof Mitra open computer kiosks in multiple places in

India and this was known as “The Hole in the Wall” experiment (Mitra, 2015). This experiment evolved to what Mitra called the SOLE approach. Prof Mitra -a physicist by trade- noticed the resemblance between how children behave in SOLE and what storm systems and birds do when they self-organise.

Mitra (2014b; 2015) stated that in SOLE children self-organise and what emerges is learning, which Sumara and Davis (2006) classified as one of the properties of a complex system. In SOLE, once the question (i.e. source of perturbance) (Morrison, 2006; Morrison, 2008) is present, the system (i.e. groups connected to the Internet) begins to adapt to the environment in the quest for answers. Unaided by adults (i.e. lack of external control), participants seek an answer by researching the Internet, walking around to other groups in the room to transport ideas and knowledge from group to group (i.e. strengthen the connections in the system) (Siemens, 2005), and finally arriving to one or more possible answers. The new order that emerges from self-organisation is learning, that reveals itself as students present the findings to the question.

SOLE has not yet been described as a complex system where its connected parts self-organise. This thesis work will attempt to show how groups of children working in SOLE situations can form complex systems of interactions for Internet comprehension enterprises. It is one of the purpose of this thesis to expand the understanding of SOLE as a complex system of interconnected parts.

Chapter 3. Methodology

3.1 Introduction

In previous chapters, the history of schoolbooks was used to trace the origins of America's reading education and the constant use of scaffolds as a central measure for reading instruction. A problem statement and possible solution was proposed to address an aspect of the current educational crisis. Then, a literature review revealed a gap that justified the purposes of this study: the need to investigate Internet comprehension in the context of Self-Organised Learning Environment (SOLE). In this section, a methodology is proposed to address this research gap.

3.2 Epistemology and ontology for a SOLE study

This study adopts the Complex Systems paradigm to explain the nature of a phenomena. It assumes a Complexity Thinking (Davis and Sumara, 2006) epistemology while adopting Complex Systems (Haggis, 2008) for its ontology. Reading of offline texts and Internet research and comprehension in this study are understood as the emergence of meaning through complex interactions with the reader(s), texts, activity and context in which it takes place (RAND Reading Study Group, 2001). This study rejects the deterministic notion that comprehension is a linear process that occurs when a reader decodes a text and/or performs searches in Internet environments and it moves forward away from Constructivist views of reading as a socially constructed activity to the emergence of comprehension in complex systems like the Internet.

Epistemology is "the study of the nature of knowledge and how we come to know the world of things" (Burr, 2015, p. 104). Complexity Thinking (Davis and Sumara, 2006) departs from the deterministic idea that there is a set reality ready to be discovered while understanding the construction of reality beyond a represented space and time as described by Social Constructionism (Berger and Luckmann, 1991). Complexity thinking acknowledges that there are not pre-determined realities but those that emerge in social interaction and interactions with artefacts based on the histories of its constituents (Haggis, 2008). These constantly emergent realities are then the interest of study. Complexity Thinking provides the opportunity to challenge previous assumptions and to examine constructs as they emerge in interaction, which is the purpose of this thesis.

An epistemology of education answers three important questions: What is reality? What is knowledge? What is learning? According to Complexity Thinking, reality is not a single or true reality but multiple and multiplied realities emerging when humans interact with other humans and artefacts (Haggis, 2008). Reality is explained in terms of rules and boundaries. These boundaries are created when study phenomenon are defined by rules to explain an enclosed reality (Osberg *et al.*, 2008). However, complex systems are open systems (Davis and Sumara, 2006) where the boundaries are not clearly defined because the system cannot be reduced to its elements since information is distributed in the individual parts that make the system and because these parts can interact with other systems outside the system (Osberg *et al.*, 2008). Then rules are merely tools needed to find patterns of interaction in complex systems with the understanding that once a rule is defined, parts of the system are lost.

In Complexity Thinking reality is constantly evolving and therefore, reality is not to be predicted but observed and renegotiated as the system learns (Osberg *et al.*, 2008). Reality is an emergent property of the interaction of small components, individual humans who bring personal histories of interactions forming a new complex system where the emergent reality cannot be separated either from individuals or the new emergent reality. This inseparability creates unique realities that can only be similar to realities created by other systems. Thus, Complexity theorists use tools to identify a short-lived understanding of reality (Osberg *et al.*, 2008), and it advocates for describing realities as they emerge to use as information in future systems: as the system gains knowledge, it uses its history and gained knowledge to evolve. In this sense, knowledge is not to be acquired but to be built upon.

What is knowledge? For Complexity Thinking, knowledge is an emergent property contained in nested structures (Davis and Sumara, 2006). Knowledge emerges not only in the interactions of individuals but also in the interactions of neurons (i.e. micro level) and institutions (i.e. macro level). Then, knowledge emerges where the boundaries of the nested complex system are not clearly defined since its components have the ability to belong to the micro and macro structures at the same time. Therefore, knowledge becomes a nested and incompressible system.

For Osberg et al.(2008), knowledge happens by chance, that is, the smaller components of the system choose at random solutions to evolve as a system and in this evolution it gains a history and knowledge that is eventually used to continue evolving (i.e. self-

organisation). In this sense, knowledge is not finite or outside the system; knowledge emerges from the interaction of the parts of the system in a specific space and time, therefore it irreversibly changes the system to act according to the new knowledge. In this sense, there is not a set reality but an ever-evolving one: Osberg et al. (2008) call this an Emergent Epistemology.

As for answering the question, "What is learning?" This thesis work agrees with Morrison (2008) that learning is "…a process of emergence and co-evolution of the individual, the social group and the wider society." (p. 21). Learning as an emergent phenomenon is possible because of the interactions of individuals and artefacts in the process of self-organisation and in the ability of the system to connect and co-evolve. Learning is no longer conceived from the "empty vessel" model understood as an effect of teaching or as a mere social construction. Learning for Complexity Thinking emerges in interaction and therefore it is unpredictable, uncontrollable and difficulty to attribute to a specific cause. Morrison (2008) continues in saying that learning is a "…dynamic, experiential, participatory, open-ended, unpredictable and uncertain, and cognition requires interaction, decentralized control, diversity and redundancy" (p. 22). In this sense, learning becomes an active process in which neurons, learner, space, time, processes, communities, institutions and artefacts are the conditions needed for learning to emerge.

Complexity Thinking departs from the assumption that teaching causes learning. For Complexity Thinking, learning is not caused, learning is triggered (Davis and Sumara, 2006). Moreover, if learning is understood as an emergent phenomenon of a complex self-organising system, then the understanding of learner changes. Davis and Sumara (2006) explain that, "…a learner is a complex unity that is capable of adapting itself to the sorts of new and diverse circumstances that an active agent is likely to encounter in a dynamic world" (p. 14). Therefore, learner is understood not only as the individual human being and his/her internal processes but also at the micro and macro level: neurons, organs, biological processes, humans, communities, schools, languages, cultures, etc. The learner in a complex system is therefore incompressible because its/his/her/their knowledge is distributed in the complex system. Then, the learner becomes dependent on other learners to learn, the ability of the system to evolve and the ability of the larger system in which the learner is nested to challenge the system of the learner.

In line with Complexity Thinking (Davis and Sumara, 2006), this study uses Complex Systems (Haggis, 2008) of interaction as its ontological stance for the understanding of Internet comprehension. In this investigation, there are not pre-conceived notions of what young students can do by themselves. This enquiry began with a wonder of the traditional use of scaffolds as an indispensable prerequisite to reading, making this study open to the interpretation of the data that was collected.

According to Newby (2014) "Ontology is a specification of what exists" (p. 35). This refers to the efforts the researcher must make on defining what is being researched, the nature of its existence and the categories where it belongs. Complex Systems in education are based on the principles of self-organisation, emergence, non-hierarchy and non-linearity of human interaction (Davis and Sumara, 2006; Morrison, 2006; Haggis, 2008). Complex Systems redefines how learners, institutions and communities in education are researched. First, it departs from the cause-effect model to recognize that initial conditions of any interaction are always different and belonging to unique past histories for each learner, hence focusing on multifactorial causality. It also studies interactions and process as opposed to single elements of the system since these interactions are nested in other complex systems and therefore in the creation of multiplied processes. Since interactions are unpredictable, then the focus of research is placed on effects (i.e. what emerges of these interactions). Finally, it departs from the view of structures as the mechanisms supporting learning. Complex systems understand structures as constantly created and emerging in interaction as a dynamic process (Haggis, 2008). Therefore, structures do not determine what the learner learns, they change and adapt to allow learning to happen.

In summary, Complex Systems paradigm considers that reality, knowledge and learning emerge in space and time when the parts of the system are challenged to evolve. It also structures the research of educational enterprises in a constantly emergent estate where interactions are the focus of research, which aligns with the proposal of New Literacies where all sorts of research focus and methodologies are accepted in the research of Internet comprehension while closely identifying commonalities rather than cause-effect relationships (Leu *et al.*, 2017). This paradigm emphasises the idea of multiple and multiplied nested systems as its learners belong to different systems within a space and time. In this study, offline reading and Internet comprehension were constructed in the different spaces and times in which activities took place. Participants were

constantly challenged to solve difficult texts and answer big questions. They used skills and abilities beyond reading to overpass these challenges and in this process, they created new histories for themselves.

The present research encompasses three different aspects: Reading offline and online comprehension which is an aspect of Computer Literacies (Coiro, 2011), Self-Organised Learning Environments (SOLE) (Mitra, 2014b) located in learning pedagogies related to Enquiry Based Learning and group work related to Complex System occurring in the space and time of the Internet.

3.3 Research goals and objectives

The goals of this study were to measure if there was a statistically significant difference in the reading comprehension responses of fourth graders when reading complex texts individually as opposed to groups with access to Internet for support; to find whether a significant difference existed in the reading comprehension responses of fourth graders when reading in groups with Internet support when text control was manipulated; and to understand an unexplored phenomena: how fourth graders comprehended information from the Internet in SOLE situations.

3.4 Identification of variables

According to Creswell's (2007) classification of variables, independent variables for all sub-questions were considered categorical because they were a description of a set of proposed conditions for a reading activity. The dependent variable was considered a quantitative interval variable because it referred to scores obtained in reading tests. Next, independent and dependent variables are defined for each research sub-question.

3.4.1 Question one variables

The independent variable for question one was New York City fourth-graders reading and answering questions from an eighth-grade text 1) independently without Internet access and 2) in groups with Internet access. The quantitative dependent interval variable was scores achieved on reading comprehension questions in both conditions.

3.4.2 Question two variables

The categorical independent variable for question two was New York City fourth graders reading in groups with Internet access for research support 1) to answer questions of a fourth-grade passages and 2) questions of eighth-grade passages. The quantitative dependent interval variable was 1) scores achieved on reading comprehension questions in both conditions.

3.4.3 Intervening variable

Reading and its comprehension are inherently complex processes (Snow and Juel, 2005) and therefore intervening variables are always taken into account in its research. The intervening variable for all research activities was reading engagement. Engagement is essential for reading to occur because it facilitates comprehension processes (RAND Reading Study Group, 2001). This was done by informally observing engagement and completion of research activities. It was noted that in phase 1 of the study, students constantly engaged in reading activities to answer research questions, thus completing all proposed activities. Then, during the pilot study, the same engagement behaviours and activity completion were observed for the first five of the 15 sessions. After such time, students refused to complete reading activities. As for phase 2, in SOLE situations, students remained engaged in the reading/searching activity for most of the time, unless a website page loaded up slowly forcing students to wait. During such times, students engaged in personal conversations as noted in audio recordings and observations. However, all participants of phase 2 completed all research activities as proposed for this phase.

3.4.4 Confounding variables

A group of confounding variables (Creswell, 2007), affecting the results of the investigation was identified throughout the different stages of the study. First, the student population of the public-school system of New York City was a confounding variable: students' backgrounds varied according to location, educational services and program. Regarding location, students were grouped by ethnicity, language and economic status because of the relationship between housing and income. In this study, most students were African American and Hispanic of low-income backgrounds. Research suggests a high correlation between African-American and Hispanic students

being mostly from disadvantaged economic backgrounds (Independent Budget Office, 2013) presenting low academic skills (RAND Reading Study Group, 2001) and attending low performing schools, while White-American areas are known for better reading scores, teachers, and chances of attending college. This was the case in this study: most students performed below the expected standards in reading according to Department of Education of New York City, further explained in sample section.

Additionally, high performing schools receive better funding and hence the ability to choose curriculums and reading programs that would benefit their student population's reading performance. For low performing schools, funding is limited and thus they can only access low-cost or free programs. Most of these programs do not offer on-going professional development for teachers, which has shown to improve implementation and student success (Duke and Mallette, 2011). This was the case for all participating schools: similar reading programs, and low professional development in on-going basis.

Another confounding variable for phase 1 was participants' prior knowledge, which affects reading comprehension (RAND Reading Study Group, 2001). Selected topics and passages for this study were based on school mandated content for science and social studies (New York City Department of Education, 2008). Reading topics were grouped according to sessions: sessions 1, 2, and 3 were science related and sessions 4, 5, and 6 related to social studies. Then, if prior knowledge was in fact a confounding variable, topic selection process ensured equal chance for prior knowledge to influence all reading conditions. Prior knowledge is discussed in a separate section for research question three as a non-influencing variable.

3.5 Research design

This study was completed in two phases and a pilot study: phase 1 addressed research questions 1 and 2, pilot was done to test activities for phase 2, and phase 2 addressed research question three. This section is structured as follows: setting, population and materials are explained together for both research phases; design, sampling, procedure, data collection and analysis are described for each phase. Figure 3.1 shows the process that was followed to solve research questions 1 to 3:

Figure 3.1 Summary of Research Design

This research is based on the understanding that reading (RAND Reading Study Group, 2001) and Internet comprehension (Leu *et al.*, 2017) are multi-layered processes dependent upon reader, text, context and activity. Hence the adoption of a Complex Systems approach (Davis and Sumara, 2006), that allowed the researcher to unveil a self-organising reality by use of a mixed methods approach. In this section, a rational and description of the overall research design is provided.

In referring to the multi-layered process of reading, RAND (2001) explains the sources of variation of the reading comprehension process through the four interacting factors in reading comprehension variability in readers (i.e. socio-cultural influences, group differences, inter-individual differences, and intra-individual differences), text variability (e.g. narrative versus informational text), variability in activity (i.e. purposes for reading) and context variability (e.g. school setting, classroom, and community). Additionally, Leu et al. (2017) have proposed a New Literacies approach that refers to the term Internet search and comprehension to encompass all kinds of study phenomena related to students and the Internet. In this comprehensive view, Leu et al. (2017) propose the acceptance of varied theories of explanations and methodologies for the study of Internet phenomenon. In appreciation of the complex acts of offline reading and Internet comprehension, they recommended that researchers consider diverse

methodologies to account for the inherited variability and constant evolution of these activities. This position indirectly points out at the complexity of Internet comprehension that cannot be understood from one theory or one method of data collection and analysis but those that allow to capture the ever-changing Internet phenomenon.

This research adopted Teddlie and Tashakkori's (2010) definition of mixed methods: "research in which the investigator collects and analyses data, integrates the findings, and draws inferences using both qualitative and quantitative approaches or methods in a single study program or inquiry" (p. 15). This study also abided by the authors' typology of mixed methods based on the number of research phases in which quantitative and qualitative methods were integrated, recognizing the need for full integration of methods in the conceptualization, experiential and inferential stages. Hence, this combination of methods captured the complexity of the reading process, significantly enhancing the study's analysis, interpretation and results.

In turn, this integration led to the use of a multiphase research design (Creswell and Plano Clark, 2011). The two phases were as follows: first phase answered questions one and two to inform the need and conditions for phase two, then the second phase addressed research question three. In other words, phase one determined if in fact fourth-graders could answer questions from eighth-grade level texts and the conditions under which groups acquired higher levels of comprehension (i.e. reading fourth versus eighth-grade level texts), while phase two was informed by the results obtained in phase one.

Mixed methods approaches as explained by different authors (Tashakkori and Teddlie, 2010; Creswell and Plano Clark, 2011) has its own critics. Originating in the need of a research method that could simultaneously accommodate qualitative and quantitative approaches to research, the first criticism came from authors for whom their own research paradigm entered in conflict with this combination of methodologies (Creswell and Plano Clark, 2011). Authors argued that since mixed methods brought together two fundamentally opposing epistemologies or ways of thinking about research, then its combination was contradictory at best and unsubstantiated at worst (Maxwell and Loomis, 2003). In order to overcome such initial basic challenges, Creswell (2011) invited critics of mixed methods research to write for the *Journal of Mixed Methods Research (JMMR)* to forward the conversation to in-depth issues. As a result, Symonds

and Gorard (2010) rightly posited, mixed methods, “a label grown out of two existing stereotypes…” (p. 2), needed its own paradigm, which Creswell (2011) then supported by using Kuhn’s (1970) paradigm shift explanation and listing most common criticisms of mixed methods.

Creswell (2011) called for establishing compelling evidence towards the need for a new paradigm. Symonds and Gorard (2010) brought attention to construct validity of mixed methods by explaining how the two opposing stances (i.e. objective versus subjective reality) are adopted by wrongful believes that sampling, data and methods employed are exclusive of either stand, that is, specific methods belong to specific paradigms. Then, they bring into question biases provoked when adopting a mixed methods stance: creating frameworks to match the mixed method philosophy, the assumption that mixing methods is a more enriched way of developing research and the diminishing cause of placing more value on mixed methods than qualitative or quantitative approaches. Similarly, Giddings (2006) points out at a confusion with mixing methods - advocated by Creswell and Plano (2011)- as opposed to mixed methodologies, in which it is implied that paradigm stances are mixed. Symonds and Gorard (2010) explain the need for a better paradigm construct to move beyond the “mixing of the methods” understanding.

Overall, this investigation used a sequential mixed methods design in which one phase informed the design of the second one (Tashakkori and Teddlie, 2010). In phase one, participant’s responses to reading comprehension questions and observational data were quantitized and analysed to corroborate findings. In phase two, a qualitative analysis of observations, recordings, written responses and computer screenshots were performed to understand how participants were comprehending information in SOLE situations

The next section presents a design tailored to the very needs of this study. It is organized as follows: setting, population and materials are grouped together for research phases; design, sampling, procedure, data collection and analysis are described for each research phase. Finally, a pilot study was conducted prior implementation of phase two to ensure that the planned activities were suitable for this study. More information is provided in ensuing sections.

3.5.1 Setting

This study took place in the New York City Department of Education in two public schools. They were comprised of students with similar family income and educational services (Independent Budget Office, 2013). All participants were students in fourth-grade (i.e. 9 to 11 years old) and both schools had minority low-income students, mirroring the demographic characteristics of the broader New York City Department of Education. Schools offered special education and English as a Second Language services. Enrolment at the time of the study varied from 344 to 925 students per school while average students per classroom was 25. Schools followed similar reading instructional approaches aligned to Common Core Learning Standards (EngageNY.org, 2012). Results of the English Language Arts State Assessment for 2015-16 (New York City Department of Education, 2016b) (shown in Table 3.1) indicate that schools differed on reading programs but matched in students' low reading performance:

School	Below Proficient Level	Partially Proficient	Proficient	Above Proficient
1	31.2%	42.9%	24.7%	1.3%
2	26.1%	50.0%	17.4%	6.5%

Table 3.1 English Language Arts State Assessment Results 2015-2016

This study took place in already existing classrooms and the SOLE laboratory of New York City. In phase 1, all classrooms were equipped with laptops, Internet, tables and chairs. There was a laptop per four students and Internet worked well in all sessions. Classrooms were not rearranged since the original set up suited activities of the study.

3.5.2 Population

This investigation targeted fourth-grade students in the public-school system of New York City because this is the first grade where reading is mostly used for learning while learning to read instruction decreases. Distribution of students according to phase, gender, school, socio-economic status and ethnicity for the school year of 2015-16 are shown in Table 3.2:

School	Gender	Socio-Economic Status for the Fourth Grade	Ethnicity for the Fourth Grade

1	33 girls and 63 boys	94% of students qualify for free/reduce lunch	17.3% Black 78.3% Hispanic 0.7% Other 3.3% White
2	Phase 1:19 girls and 19 boys Phase 2: 17 Girls and 21 Boys	93.6% of students qualify for free/reduce lunch	59.8% Black 34.4% Hispanic 0.9% Other 4.3% White

Table 3.2 Distribution of Students: Gender, Socio-Economic Status and Ethnicity

Students in specialized classrooms (i.e. special education services) and those with limited English competencies were excluded since reading is dependent upon academic and language skills (RAND Reading Study Group, 2001). However, students receiving special education services for part of the school day and English learners with moderate to high levels of English proficiency were included in the study. English proficiency was determined according to a mandatory test given in schools at the beginning of the school year. Overall, students' educational needs were diverse but distributed evenly across participating schools.

3.5.3 Sample

This research took place in the public schools of New York City, making it logistically difficult and ethically sensitive to randomize student participation. Finding participants to partake of short reading sessions outside school setting was difficult due to space, transportation and time constraints. Also, heavily relying on peer collaboration, this study benefited from a more organic process in which participants were already acclimatised to the environment.

As a general sampling procedure, New York City Department of Education website was used to find all public schools serving fourth-graders (New York City Department of Education, 2014). Since school access was an important factor, the search was conducted in Manhattan and schools were contacted according to geographical position (i.e. north to south). After accepting participation, school principals chose a research phase for participation, making samples depended upon their choice. In this non-

random sample (Creswell, 2007) families of fourth-graders were given an information letter and consent form as an invitation to participate in the study.

Since ethnic and socio-economic distribution of New York City schools is highly marked by location, the sampling procedure placed both schools in socio-economically disadvantaged areas of mostly Hispanic and African American students. According to the 2014–15 school population distribution (New York City Department of Education, 2016b), this sample is representative of the school system in fourth-grade: 40.4% Hispanic, 27.8% African American, 15.3% Asian, and 14.7% White, indicating that 68.1% of the population was represented in the sample. Regarding economic status, this sample represented the majority of students served in the public schools: poverty levels are measured through qualification to free or reduce-priced lunch program and accordingly, the enrolment for 2014–15 for fourth-grade in New York City Public Schools was 79.0%. Participants in both schools had over 90% student enrolled in this program.

The voluntary sample obtained in phase 1 of the study was selected based on location, transportation, and time constraints. The sampling process was not entirely controlled by researcher but participants as well. Participating schools represented fourth-graders in the public-school system of New York City based on ethnicity and socio-economic status. Some randomization allowed for a fair representation of fourth-graders of New York City. The sample for phase 2 of the study comprised of already existing fourth-grade classrooms at the school hosting the SOLE laboratory, discussed further in this chapter.

3.5.4 Methods by research phase

This section describes two phases and a pilot study. Each phase was designed according to sampling, materials, procedures, methods of data collection, and analysis shown in here. A description of the purpose and results of the pilot study are presented here as well.

3.5.4.1 Phase 1

In this study, it was important to establish a body of knowledge regarding the first and second null hypotheses, to investigate whether groups of fourth-graders were able to read complex text meant for eighth-graders using the Internet as a supporting tool and if

reading performance changed when groups read fourth versus eighth-grade texts. Establishing what occurs when traditional scaffolds for reading and collaboration are lifted was a necessary precursor to phase 2.

3.5.4.1.1 Sampling design

Onwuegbuzie and Collins (2007) identified sampling design for mixed methods as "the framework within which the sampling takes place, including the numbers and types of sampling schemes as well as the sample size" (p. 283). Sampling design for phase 1 began with a non-random sampling scheme, in which all 58 participants completed the same reading activities: reading passages and questions to test comprehension.

Sample

Participants in phase 1 came from comparable gender, educational, race and socioeconomic backgrounds. Sample included 24 females and 34 males. All 58 participants attended general education or integrated classrooms. Due to the code of ethics of the New York City Department of Education for doing research, access to identifiable data such as educational supports and English Language proficiency levels was limited. Therefore, school principals and classroom teachers refrained from sending research invitations to students considered with limited English Language abilities. Students with special education needs and proficient English Language Learners were invited yet not identified in the study. All participants came from families of low economic backgrounds who qualified for free meals in school. Ethnic backgrounds were distributed as follows: 39 Hispanic, 18 Black, and one from another background.

3.5.4.1.2 Materials

Phase 1 materials included reading passages, questions, booklets, and Internet access. This section addresses the procedure for passage selection, construction of questions, and implications of Internet access with young participants.

Passage selection

Selection of reading passages used the New York State English language arts assessment framework, which is in line with Common Core Standards (CCSS) for English language arts (EngageNY.org, 2012) and New York City Department of Education's (2008) science and social studies scope and sequence. The Passage Review Criteria for Grades (PARCC, 2014) 3–5 was used to determine text complexity and

appropriateness of text graphics. This rubric measure student proficiency relative to linguistic demands of school grade, text complexity for the grade, and graphic characteristics supporting text. The Lexile® measure of text complexity and level bands for the fourth- and eighth grades were used as well: 740 to 900 Lexile® and 1000 to 1155 Lexile® scores respectively. As for text quality, Partnership for Assessment of Readiness for College's framework of five-point criteria was used: text complexity, diversity, authenticity, intellectually motivating texts, and text meeting cultural and ethnic bias demands.

Passage content matched topics related to the Department of Education curriculum for fourth-grade (e.g. food webs and chains texts). Websites were also used to identify passages, for instance, EngageNY (2012) recommends www.lexile.com (MetaMetrics, 2015) because its database facilitates finding books according to Lexile® scores, students' age, and school grade. Other entities such as Britannica School (2015) were used because it offered Lexile® levels for articles aligned to Common Core Standards and to New York City scope and sequence (Appendix A offers a sample of a fourth-grade passage used in the study).

Reading comprehension questions

In order to test for comprehension, participants were asked to answer four questions after each reading passage. These questions were constructed according to the New York State English language arts assessment framework and the CCSS. Questions were presented in open-ended format and aimed at testing students' understanding of the central idea, textual evidence, inferences and vocabulary. While the central idea of the text in this study referred to the author's message, textual evidence referred to text details supporting the central idea, and inferences were defined as ideas implicit in the text and elicited by reader as a form of comprehension. Finally, vocabulary words were those considered pivotal for text comprehension; that is, without knowledge of these words comprehension would be affected.

Questions purposefully elicited the short-format answer, and students were asked to provide factual and inferential information found and deducted from passages, while opinion and analysis were excluded. This allowed testing of the different components of reading comprehension in a relatively short and unambiguous manner while obtaining relevant data for analysis. Questions were not used to measure participants' reading abilities or levels.

Comprehension questions facilitated planning, control of information, and data analysis, since participants were already accustomed to this evaluation format. An essay-format for reading comprehension test was considered and disregarded as it would not have provided detailed information regarding all aspects of comprehension (i.e. textual evidence, inferences and vocabulary). Overall, questions were the least intrusive and most efficient vehicle to obtain data on participants' comprehension.

Internet access

Laptops were used to access the Internet as a research tool to solve proposed questions. Internet access was provided by participating schools through the New York City Department of Education, making access free, safe, and participant friendly. Nonetheless, participants were constantly monitored for safety. During data collection sessions, all computers were set on the Department of Education's website, which is the mandatory opening page for all computers. Participants navigated their way through preferred search engines to solve questions.

Booklets

Booklets and pens were provided for students to record answers to comprehension questions. Booklets were coded to reflect each passage and research design to prevent confusion. Participants were asked to mark booklets with first and last names, but these were immediately de-identified to protect personal information. These booklets were collected at the end of each activity for analysis.

3.5.4.1.3 Procedure

After obtaining proper documentation, participants met once a week for an hour, for six consecutive weeks. On each session, participants read under three conditions: eighth-grade texts individually without Internet access, and fourth- and eighth-grade texts in groups with Internet access for a total of three texts per session. Participants had 20 minutes to read each passage and answer four questions per text on a provided booklet while groups were self-selected. Upon completion, all materials were collected, deidentified and coded to protect participants' identities.

All six sessions began with an introduction: "I am here today to see how you read independently and in groups. To do this, you will have 20 minutes to read and answer questions from a text alone without Internet access and then 40 minutes to read two texts in groups with Internet access. I will let you know which passages are meant to be

read alone and which in groups." Each text was introduced, and materials distributed. Participants were not assisted in answering questions, but they were always monitored for safety and technical difficulties. In order to prevent practice test effects, reading passages were presented in different order for each session. Figure 3.2 shows a summary of the procedure followed in Phase 1.

Figure 3.2 Summary Procedure for Phase 1

Data collection

Phase 1 employed a concurrent data collection design in order to generate complementary data (Onwuegbuzie and Collins, 2007). Participants' answers to comprehension questions were collected for all six sessions and all conditions for analysis. In this section data collection procedures are described and justified.

Answers to reading comprehension questions

In order to measure reading comprehension, participants answered four questions after reading each passage. They recorded answers in booklets and these were collected from each participant, group, and reading activity. All 72 questions were transcribed and deidentified to prevent bias in the scoring process and to protect participants' identities. Then, scores were entered for analysis into IBM Statistical Package for the Social Sciences (SPSS) Version 22, a statistical computer program. Table 3.3 provides a summary of the research design for this phase:

Sample	**Condition**	**Methods of data collection**	**Sessions of data collection**	**Methods of data analysis**
Individual	Eighth-grade texts No-Internet	Written texts	Sessions 1-6	Statistical analysis
Group	Eighth-grade texts Internet access	Written texts	Sessions 1-6	Statistical analysis
Group	Fourth-grade texts Internet access	Written texts	Sessions 1-6	Statistical analysis

Table 3.3 Summary of Design Phase 1

Data preparation

Data was deidentified to protect participants' identity. For ethical reasons, only the principal investigator had access to original data. In this process, a list was created with participants names and numbers assigned.

Validity and Reliability for phase 1

Validity and reliability of the study were ensured considering the purposes and scope of this investigation.

Validity

According to Creswell (2007), validity of a test is "the development of sound evidence to demonstrate that the test interpretation (of scores about the concept or construct that the test is assumed to measure) matches its proposed use" (p. 159). Reading passages and comprehension questions were constructed in line with New York State English Language Arts Assessment (NYSELAT) framework and Common Core Standards.

Content validity was addressed by choosing texts matching the criteria for NYSELAT and creating comprehension questions that clearly defined constructs for testing comprehension (i.e. central idea, textual evidence, inferences and vocabulary). Then, Passage Review Criteria for Grades 3–5 and Item Review Criteria for Potential Grades 3–5 ELA Questions (EngageNY.org, 2012) was used to text agreement between the four aforementioned constructs. For instance, the reading passage "Food Chains" (Encyclopædia Britannica Inc, 2015) fulfilled the requirements for passage selection for fourth graders in New York City, while the question "Why there are not higher food chain consumers after the quaternary levels?" asked the reader to infer and use textual evidence to answer the question. These criteria were applied to all passages and questions, and those fulfilling it were chosen for study.

Additionally, two fourth-grade teachers were presented with the passages and they recognized their value to address CCLS and the scope and sequence for science and social studies for New York City. Teachers used some of these texts in subsequent year in their classroom because of its preparation value for the English test. Also, the New York City Institutional Review Board (IRB) assessed all materials used in this study to ensure they were set to measure reading comprehension. A designated IRB manager and then a team reviewed and provided feedback regarding the content validity of

passages and questions. Feedback was taken into consideration and instruments were improved accordingly.

Criterion validity as defined by Muijs (2004) could not be demonstrated in this phase because all reading materials related to passages were above the students expected reading levels and because they were solved in groups. Both measures were not standard for school settings and thus there was not contrasting evidence at this point to measure criterion validity. Nonetheless, it was predicted before data collection and after data analysis that the majority of participants were going to score in the lower levels of comprehension if the text was actually meant for students in upper grades (i.e. four years ahead of the participants' level of schooling). Data corroborates low levels of comprehension of eighth-grade passages especially in individual reading instances.

In order to prevent test practice (Duke and Mallette, 2011), research conditions were alternated, that is, session 1 began with individual reading and ended with group reading, while session 2 followed a reverse procedure. This prevented participants from developing strategies that would assist them with solving passages. Finally, the researcher did not mention passage level of difficulty to prevent student bias towards texts. Once all sessions were completed, participants were informed about the nature of texts.

Reliability

A series of analyses were conducted in order to determine the extent of interrater reliability. Cohen's Kappa was used to measure interrater reliability (Refer to Table 3.4). Perfect agreement was found with respect to questions 1, 3 through 5, 7, and 8, with strong agreement indicated with respect to questions 39, 40, 42, 57, 58, 59, and 60. Low to moderate agreement was indicated with respect to questions 37, 41, 43, and 44. *S*tatistical significance was indicated in all cases with the exception of Q38. Overall, interrater agreement was found to be acceptable with regard to these questions analysed.

Question	**Kappa (*SE*)**	**Approximate *T***
Q1	1.000*** (0.000)	3.873
Q2	–	–
Q3	1.000*** (0.000)	3.873
Q4	1.000*** (0.000)	3.873

Q5	1.000*** (0.000)	3.464
Q6	–	–
Q7	1.000*** (0.000)	3.464
Q8	1.000*** (0.000)	3.464
Q37	.232* (.113)	2.171
Q38	.000 (−)	0.000
Q39	.765*** (.108)	5.788
Q40	.483*** (.094)	4.675
Q41	.204** (.067)	3.140
Q42	.404*** (.096)	4.113
Q43	.348** (.138)	2.675
Q44	.304** (.093)	3.121
Q57	.655*** (.145)	4.837
Q58	.887*** (.074)	6.309
Q59	.839*** (.087)	6.423
Q60	.491*** (.114)	4.470

Note. *p<.05, **p<.01, ***p<.001.

Table 3.4 Summary of Cohen's Kappa Values

3.5.4.2 Pilot study

A pilot study tested activities proposed for phase 2, to observe how participants responded to reading activities chosen by the researcher: two reading texts, access to the Internet and questions to solve three times per week for five weeks. Based on Deci and Ryan's (2012) Self-Determination Theory, it was suspected that a reading activity imposed on participants could trigger behavioural problems.

The sample for this pilot came from the same two schools. In attendance were 36 participants and of those 21 were in the intervention group and 14 were in the control group. Two groups were necessary to compare activity effects. If only the intervention group demonstrated increased behavioural difficulties, it could be implied that activities had a negative effect on participants in the intervention group because of repeated exposure.

Upon implementation, the intervention group displayed disruptive behaviours. The first two weeks, participants complied with activities, but after such time they refused reading, arguing it was boring and purposeless. Most participants engaged in problematic behaviour such as verbal insults, chatting and walking away from the classroom, and they clearly stated the lack of purpose and need to complete these activities. Considering the events, a new design was proposed that encouraged children to read. These activities are discussed next.

3.5.4.3 Phase 2

Introduction

After establishing a statistically significant difference for conditions in phase 1 and the negative effects observed in the pilot study, a new design was implemented to investigate how group reading in a Self-Organised Learning Environment (SOLE) occurred. The sample for this phase came from fourth-graders attending the school hosting the SOLE laboratory, which is explained next.

Sampling design

Sampling design for phase 2 began with a non-random sampling scheme (Onwuegbuzie and Collins, 2007), after the SOLE laboratory was built in the hosting school. Two fourth-grade classrooms were invited to participate. There were two kinds of classrooms: integrated co-teaching services (i.e. inclusion of special needs students with typically developing students) and a general education classroom for typically developing students. In order to make these samples comparable, participants from each classroom were divided in two groups: those in need of special education services and those in general education. These two groups were sent invitations and then randomly selected to group 1 or group 2, which attended the SOLE laboratory at different times: group 1 had 19 participants and group 2 had 20 participants. Due to New York City Department of Education code of ethics for conducting research activities with minors, only teachers had access to this information and they only informed the researcher of the number of students with special education needs in order to protect their identity: each group had 9 students with special education needs.

Sample

Participants came from comparable gender, educational, ethnic and socio-economic backgrounds. Once again, due to code of ethics, specific sample demographics cannot be reported here. In general, for the fourth-grade, the hosting school included 39 participants: 59.8% Black, 34.4% Hispanic, 4.3% White, and 0.9% other. Also, 93.6% of participants qualify for free/reduced-price lunch, which indicates low family income.

Materials

Phase 2 encompassed a set of materials related to the SOLE laboratory. Internet access was explained in phase 1, making a review of it unnecessary here.

Self-Organised Learning Environment (SOLE)

The purpose of this laboratory is to allow children to self-organise for learning when solving big questions. It was furnished for student collaboration mirroring other SOLE rooms in England and India (The School in the Cloud, 2014). It has six 32" Smart TVs with Internet connection, a table and a bench per TV, and a dry erase board to display the big question (Image 3.1 shows SOLE laboratory). Following the basic premise of self-organisation as a system of connected parts (Davis and Sumara, 2006), large and limited numbers of Smart TVs purposefully form a half moon shape for all participants to be able to see the information on their screens as well as each other's' screens.

Figure 3.3 SOLE Laboratory, New York City

This laboratory is not considered a classroom: teachers set then environment by designing and then asking big questions. It is not meant for instruction but to facilitate self-organisation, conversation and collaboration among students. In this study, the principal researcher posed the big questions and conducted all sessions.

Big questions

Big questions in SOLE are designed to inspire children to self-organise for learning (The School in the Cloud, 2015). Questions are usually open-ended, difficult to solve and they encompass different content areas with potential to elicit problem solving, critical thinking and collaboration. For instance, "What conducts electricity better, a lemon or a potato?" is a SOLE question addressing the fourth-grade curriculum that prompts use of these skills. Questions were designed based on science and social studies curriculum to ensure a relationship between content, a school's academic goals and standards, and SOLE sessions. It was planned to ask questions in clusters of three, that is, the study began with three questions related to social studies, then three questions related to science, until the 15 sessions of the study were completed. However, upon request from the school principal, more electricity questions were asked than social studies. The topics for all questions mirror the topics teachers were covering in the classroom at the time of the study: for social studies questions were related to the history of the Iroquois communities and for science questions about electricity were asked. These were the 15 questions asked in the study:

1. Why did the Iroquois tribes settle so close to each other?
2. Why Iroquois lose their eyesight towards the end of their lives? How could this have been prevented?
3. Why is the Iroquois Confederacy consider the oldest democracy in America?
4. What is a dynamo and how does it work?
5. How does a dynamo generate energy?
6. How to power a light bulb with wind?
7. How can you generate electricity with potatoes? Set up an experiment
8. What conducts electricity better: a lemon or a potato? Explain.
9. Why did the Iroquois live in longhouses? How did Iroquois build longhouses?
10. How did the Iroquois avoid frostbite and hypothermia?
11. How did animals influence the Iroquois clothing and weaponry?
12. Explain why solids conduct electricity better than liquids

13. Why don't all fish die when lightning strikes the sea? Explain with pictures
14. Using alternative energy, how can we light up our Christmas tree?
15. Where does electricity go when it strikes the ocean and the antenna of the Empire State Building?

Procedure

Upon arrival to the laboratory, the researcher explained four basic rules: 1) form groups to share a Smart TV and answer the big question; 2) you can switch groups at any time; 3) you can see what other groups are doing and report back to your group; and 4) you make a presentation to show your findings (Mitra, 2014a) by saying it in your own words. Then, the researcher presented the big question writing it on the whiteboard for reference. Participants freely chose a TV station and group, and sometimes they switched groups eventually finding one they liked. Researcher ensured physical and virtual safety, constantly monitoring participants without intervening with the research process (e.g. assisting students in answering big question, suggesting websites for research, rephrasing the big question, etc.). Once research time was over, participants gathered together to present and discuss findings. Time allocated for each session was: 1) 5 minutes to present the big question; 2) 20–25 minutes to research and write answer; 3) 15–20 minutes to present findings. Groups met three times a week for 45 minutes per session for five consecutive weeks. Figure 3.4 shows a summary of the procedure followed in Phase 2:

Figure 3.4 Summary of Procedure for Phase 2

Data collection

This study used a combination of audio recordings, observations, and screenshots to answer research question, hence, its concurrent data collection design (Onwuegbuzie and Collins, 2007). Data collection and analysis are presented in the ensuing section. Summary or design for question 3 is provided in Table 3.5.

Data collection for Question 3

A qualitative approach was used to answer question 3. Data was collected from three different sources: audio recordings, observations, and screenshots of websites visited during SOLE. Limits were applied to the data according to recommendations from Complexity Theory (Davis and Sumara, 2006). Considering the ever-changing nature of self-organised systems, the researcher decided data should be collected from one group per SOLE session only. Groups were selected using a true random number website (Haahr and Haahr, 1998) by entering the range of numbers one to six, corresponding to the six stations available in the laboratory.

SOLE allows participants to switch groups or obtain information from other groups by walking around the laboratory. These instances were recorded by mentioning when participants left and came back to the group in the observation log. However, participants' whereabouts after leaving the group were not recorded. This holistic combination of data was analysed to find how students read Internet material in SOLE sessions. Data collection methods are explained next.

Audio recordings

Groups were audio recorded to compare with other sources of data (Cohen, 2011). Recordings took place during intervention sessions 1, 6 to 15 and they began minutes after participants went to solve the big question. They ended when students were asked to share findings. An iPhone application was used to record sessions. Use of a microphone could not isolate background noise, making transcriptions difficult and at times inaudible. However, for the most part, recordings were legible and reliable.

Observations

Informal observations were used to record reading process in SOLE sessions (Creswell, 2011), describing what participants were doing during observations. A group per session from the intervention group was selected for observation. The same procedure for selecting groups for audio recording was employed here.

A recording form was developed prior to data collection to provide a focus of observation. This form consisted of an open-ended question and a description of behaviours to be observed (See appendix C for more information). Due to personnel constraints, only the researcher recorded observations. All observations started when

the first participant grabbed the mouse and/or keyboard to type the big question and they ended when participants were asked to present findings.

Screenshots of visited websites

As groups conducted searches on the Internet, it was important to capture information on visited websites to obtain a comprehensive picture of the reading process. A point and shoot camera was used to record information. Participants' faces were not photographed for identity protection and to comply with ethical demands of the Department of Education of New York City.

All three instruments of data collection were used to triangulate the reading process followed by participants when reading Internet texts. Table 3.5 summarises data collection instruments and methods of analysis used to answer research sub-question 3.

Sample	**Methods of data collection**	**Sessions of data collection**	**Methods of data analysis**
Randomly chosen group on a TV station	Audio recordings	Sessions 1, 6-15	Interaction analysis Conversation Analysis
	Observations	Sessions 1, 6-15	Interaction analysis
	Screenshots	Sessions 1, 6-15	Interaction analysis

Table 3.5 Summary of Design for question 3

Data preparation for question 3

For question 3, audio recordings and observation material obtained in this phase were de-identified and transcribed to protect participants' identities. For ethical reasons, only the principal investigator had access to original data.

3.5.5 Data analysis

This section contains two different analyses of data to answer the three research questions. Analysis is presented by research phase. Phase 1 provides an analysis related to research questions 1 and 2 while phase 2 analyses data for question 3.

3.5.5.1 Data analysis for phase 1

A statistical analysis tested null hypotheses corresponding to sub-questions 1 and 2: H_1. It was hypothesised that fourth-graders of New York City public schools will not display statistically significant difference in comprehension scores when reading eighth-grade texts individually in comparison to group reading with Internet access for research support as measured by scores obtained on text comprehension questions, and H_2. Fourth-graders of New York City public schools will not display statistically significant difference in comprehension scores when reading in groups with Internet access for research support of fourth-grade texts in comparison to reading eighth-grade texts, as measured by scores obtained on text comprehension questions.

Statistical Analysis

This data set was scored using the modified version of the New York State English Language Test Blue Print Rubric while data was quantitized using a zero to two-point scale for each category. Missing information was given a score of 999 for data control purposes (See appendix B for more information). After scoring all texts and creating a SPSS file, a one-way ANOVA was conducted to test both null hypotheses. This test was used because it allowed for comparison of multiple means to uncover if they were similar or statistically significantly different (Field, 2009). A one-way as opposed to a two-way ANOVA was the correct statistical test since both research questions had two independent variables and one dependent variable. The alpha level of the study was $p < 0.05$ to prevent incorrect rejection of null hypotheses.

Descriptive statistics were conducted for a general data view. These were sample sizes, means, standard deviations, standard errors, 95% confidence intervals, and minimum and maximum scores associated with all outcomes analysed on the basis of group membership. Test of homogeneity of variances was conducted to determine if ANOVAs violated the assumption of homogeneity of variance. Finally, a post-hoc analysis was used to determine which ANOVAs were statistically significantly different.

3.5.5.2 Data analysis for phase 2

Question 3 was answered using Conversation Analysis (CA) of audio recordings while using observations, and screenshots to complete audio data. These procedures are explained next.

Data analysis Question 3

As noted in Chapter 2, the study of Self-Organised Learning Environments (SOLE) is explained under the Complex Systems paradigm. To answer research question 3, an analysis method that acknowledged how people and artefacts interact for reading complex texts in a SOLE scenario was necessary. Interaction Analysis (Jordan and Henderson, 1995) was used to analyse audio recordings while observations and screenshots of visited websites were used to support audio recorded data. Only one element of Conversation Analysis (Ten Have, 2007) – Unmotivated Look- was embedded in the analysis to better understand data.

Interaction Analysis

Interaction Analysis (IA) was popularized by Flanders (1966) when he used audio and video recordings to analyse teacher-student interactions in classrooms. IA has evolved from quantifying interactions to describing interactions of humans and objects in naturally occurring settings (Jordan and Henderson, 1995), and most recently to the integration of IA and knowledge construction (DiSessa *et al.*, 2015).

Years after Flanders' (1966) idea, Jordan and Henderson (1995) proposed a new definition of IA:

> Interaction Analysis, as we describe it here, is an interdisciplinary method for the empirical investigation of the interaction of human beings with each other and with objects in their environment. It investigates human activities such as talk, nonverbal interaction, and the use of artefacts and technologies, identifying routine practices and problems and the resources for their solution. (p. 39)

According to Jordan and Henderson (1995), the unit of analysis in IA expanded from people's interactions to interaction with objects produced in natural settings. They posited some assumptions. First "...knowledge and action are fundamentally social in origin, organization, and use, and are situated in particular social and material ecologies" (p. 41). Knowledge is not exclusively held by individuals but constructed in

social practice. Hence the second assumption: these socially constructed practices provide verifiable data for appropriate analytic knowledge of the world.

Jordan and Henderson (1995) proposed foci of events as elements for conducting comprehensive data analysis to depart from data coding and characterisation. Events were defined as "stretches of interaction that cohere in some manner that is meaningful to the participant" (p. 57). They are time defined as they occur in chunks or segments of activities of knowledge construction (Hall and Stevens, 2015) created by participants and materials.

First foci, boundaries for events are determined by transitions produced by people and objects: defining event beginnings and endings provide a starting point for event segmentation, which facilitates recognition of internal structures of events.

Second foci of events: temporal organization of the activity at the macro level and its rhythm and periodicity. Macro level refers to external demands shaping interactions between people and objects (e.g. time given in a SOLE session to answer the big question and macro structure participants establish to answer the big question). Action sequences (i.e. events in this case) contain a rhythm and periodicity, in which participants engage to effectively communicate. In this study, rhythm was when participants had already negotiated how interactions were going to be carried out (e.g. typing the question, holding the mouse, reading aloud and following reading, etc.) from Internet either in unison or to each other while periodicity is the routine of activities to solve the big questions (e.g. follow the structure of SOLE sessions: present question, select group and TV station, research and present findings).

Third foci of events: turn-in-interaction in which "Not only must 'turns at talk' be considered, but also 'turns with bodies' and 'turns with artefacts'"" (p. 64). Turn-in - interaction exists in context and it is influenced by people's actions, which are influenced by artefacts. Hall and Stevens (2015) called this identification of members' relevance and consequentiality, which is how members' assumed roles are affected and affect future members' actions. These interactions are explained in a continuum: in one end are those activities mainly accomplished through talk (i.e. talk-driven interaction), and in the other end are activities mainly influenced by interactions with physical objects (i.e. instrumental-driven interaction). In IA, turn-in-interaction moves along this continuum as people and materials interact.

Fourth foci of events: participating structures refer to how participants focus and orient themselves to common tasks. Task structures influence and dictate the way in which people interact with others and objects. IA focuses on how collaboration and coordination are achieved by individuals within a common participating structure.

Fifth foci of events: trouble-repair indicates how participants respond to breaches in local interaction. This trouble-repair involves conversational identification and use of artefacts and context in which trouble is generated in order to repair it. For instance, in interactions between humans and computers, repair of possible trouble produces human learning and thus it can be discovered through IA.

Sixth foci of events: spatial organisation of an activity tells how individuals and their communities use space. It explains how space influences participants' interactions with others and artefacts. Use of space influences who talks first, who holds power over a group, and how collaboration among participants is either facilitated or hindered.

Finally, the last Foci of events are the artefacts and documents facilitating or hindering social interaction. In order for people to become part of a community, they are to interact with such artefacts and documents shared by the community.

In recent years, Interaction Analysis (IA) and Knowledge Analysis have been integrated, seeking to unveil how knowledge is constructed in the interaction of people and materials (DiSessa et al., 2015). Hall and Stevens (Hall and Stevens, 2015) argued that knowledge in use should be the unit of study in IA, where inferences about knowledge are made through visible and noticeable acts of interaction before exploring internal mechanisms of knowledge acquisition. Hall and Stevens (2015) concluded that:

> The IA perspective informs our understandings of what counts for knowledge, where and how it needs to be found, and how it is learned. It informs how we see knowledge as the same (or not) across time and place. (p.101)

This new intertwined model facilitates the study of such learning environments as SOLE. In SOLE, learning emerges from participants' self-organisation (Mitra, 2014b) in interactions with computers and Internet. Use of the integrated model in this study accounted for the participants' interactions and orientations according to a task (i.e. answering big questions) and materials as presented in the SOLE laboratory (i.e. limited number of computers with Internet access, collaborative table/bench stations, computer

mouse and keyboard). Next, some elements of Conversation Analysis are explained as it was used to better understand how participants solved complex texts.

Conversation Analysis

Conversation Analysis (CA) is defined as "the systematic analysis of the talk produced in everyday situations of human interaction: talk-in-interaction" (Hutchby and Wooffitt, 2008, p. 11). CA examines naturally occurring data of people's talk-in-interactions in detailed form. Data is taken from real life experiences of talk-in-interaction and then analysed to uncover an apparent order (Ten Have, 2007) that has been chosen by the participants of the interaction in response to specific social activities.

This talk-in-interaction obeys to certain order, rules, procedures or methods. Then, "The objective of CA is to uncover the often-tacit reasoning procedures and sociolinguistic competencies underlying the production and interpretation of talk in organised sequences of interaction" (Hutchby and Wooffitt, 2008, p. 12). These organised sequences come from the idea that interactions produced in conversation have an order and thus patterns. They are the structures used in CA to discover how people organise interaction in specific activities and places in time.

Sacks (2004) began the study of CA with a characterization of turn-in-conversation. He outlined four required features: 1) one person spoke at a time; 2) only one turn is allocated for each exchange; 3) there was a linear arrangement of allocation turn; 4) turn size was correlated to the linear array. In order to maintain the first fundamental rule of conversation, constructional techniques should be maintained. That is, for turn-allocation, either the speaker selects the next speaker or a speaker self-selects. Finally, speakers adapt turn size to ensure integration of turn-in-interaction techniques and minimization of gaps and overlaps.

To this end, Schegloff (1968) added that sequence in conversation follows an ABAB pattern in which speakers take turns and modify conversation according to the previous turn. Conversation is constantly maintained by interaction and goals of both parties. For this, the author posited the distribution rule and highlights deviant cases. The distribution rule states that the answerer—of a telephone conversation—speaks first while the caller provides the first topic of conversation (Schegloff, 1968). Special attention is given to deviant cases, in which the distribution rule is violated. Schegloff

(1968) established the summons-answerer sequence to explain the deviant cases: in the absence of a summons, the caller delivers the summons, seeking to establish a conversation.

Elaborating in the aforementioned works, Ten Have (2007) proposed four types of interactional organization: turn-taking organization, sequence organization, repair organization and the organization of turn design. However, the author highlighted the importance of beginning any analysis of conversation with the Unmotivated Look approach, in which the researcher approaches data with a bias-free attitude to make general sense of it.

In this study, some elements of CA were used to closely examine participants' interactions with themselves and artefacts in SOLE sessions leading to the understanding of Internet texts, based on the assumption that conversational exchanges have an order thus allowing for the systematic study of patterns of interactions.

A mixed analysis of data

In this study, a mixed combination of analysis techniques was used, where Interaction Analysis (IA) was the main framework for analysis and *only* one element of Conversation Analysis (CA) was applied to better support this procedure. The selection of main sequences of interactions, then events and segments, are described here sequentially. Analysis of such episodes is described in a combination of IA's foci of events.

Unmotivated Look

The Unmotivated Look technique in CA dictates that to conduct a data analysis that is reliable, the researcher is to approach the phenomenon in its most natural occurrence and without preconceived theories or assumptions (Schegloff, 1968). In the pilot study, the researcher noticed that in addition to reading and collaborative skills, participants created an environment for learning in interaction with the Internet. However, due to the inconsistency in collaboration and unwillingness of participants to complete these activities, data was insufficient to explain this phenomenon. During phase 2 limits were built into the data collection as recommended in Complexity Thinking (Davis and Sumara, 2006), ensuring observation, audio recording and screenshot collection of only one group of participants per session from the moment they typed the big question until

they wrote an answer. Then, CA's Unmotivated Look was used to reveal important sequences of interactions: this first look indicated that in all ten recordings participants followed what at first looked like a linear cyclical process (Discussed in Figure 3.6) of participant behaviour influenced by how the Internet presented the information to the user to answer the big question. Interestingly, a second look indicated that what appeared as cyclical and linear behaviour was actually a complex system. Data was then analysed at the macro level of interaction to uncover this system.

Macro level Interaction Analysis: structure of events

Jordan and Henderson (1995) used the term *event* to characterize stretches of interactions between participants and artefacts. In order to segment the structure of events and define their purpose, a Macro Interaction Analysis was conducted and Ten Have's (2007) recommendation for systematic analysis was used as follows: 1) for all ten transcribed audio recordings, events were identified by defining beginning/ending of interactions supported by observations and screenshots and marked by change in interaction with Internet. For cases in which this was unclear, beginning/ending of previous/next interaction marked beginning/ending of problematic interaction; 2) each event was then labelled and described by answering, "What were participants doing in this segment?" 3) Finally, to group labels into categories describing SOLE, stages were defined by answering, "What were participants doing to answer the big question?" Cases in which participants' interactions were unrelated to answering the question were grouped with a previous segment, unless it indicated a transition such as chatting while a website's page loaded up (See appendix D for a sample of segmented, labelled and classified audio recording).

Figure 3.5 Summary of Macro Interaction Analysis

This analysis revealed what appeared to be the categories of a linear cycle (Figure 3.6). First, question was typed on Internet browser *(Question Typing)* either by an individual alone, assisted by teammates, taking turns or snatching the mouse to impose a turn. Sometimes, in this initial interaction, participants defined their role in the group by claiming the mouse or keyboard, while in other groups, whoever sat closest to the mouse would hold it and someone else would type and/or dictate the question. In the

following segment from session 6, the SOLE session had just begun with three (3) participants in the group:

1	**Boy 2**	"How to power a light volt with" -- [crosstalk].
2	**Boy 3**	What's wrong with this?
3	**Boy 2**	I don't know.
4	**Boy 3**	What the heck?
5	**Boy 1**	Just do right here. Cause that one is better.
6	**Boy 2**	Exactly, cause let me do it.
7	**Boy 3**	Hold up!
8	**Boy 2**	Who are you talking to like that?
9	**Boy 3**	You... off course.
10	**Boy 2**	I don't know you. Somebody who sounds like Michael
11	**Boy 3**	But I'm Michael.
12	**Boy 2**	[Imitating Michael Jackson's singing]
13	**Boy 3**	You don't even sound none like Michael Jackson.
14	**Boy 1**	**"**How to power a light bulb with wind?"
15	**Boy 2**	**"**How to power a light bulb?"
16	**Boy 1**	**"**Light bulb"
17	**Boy 2**	"Lightsss!" You know how to spell lights right? [Signing] Hit them with left, hit them with the right.
18	**Boy 1**	Do not spell Christmas.
19	**Boy 3**	Boy 1, come on! What are you doing?
20	[Laughter]	
21	**Boy 2**	Okay. That's funny, that's funny.
22	[Typing]	
23	**Boy 3**	**"**How to power...?"
24	**Boy 1**	This class are crazy.
25	[Typing]	
26	**Boy 2**	"With wind". You gotta do it with wind. "With wind" [Spelling] "W-I-N-D". Enter.

Transcript 3.1 Group attempting to type the big question in the browser

The segment begins with Boy 2 stating the question until someone interrupts him (1). Then, Boy 3 interrupts because there is something on the screen impeding them from typing the question (2) and since there are two ways of typing the question (i.e. external keyboard and digital keyboard) the boys agreed that something is wrong, and they have to use other means of typing the question. Then, Boy 2 and Boy 3 have an argument about who types the question and Boy 2 talks to Boy 3 in a way he does not like it (6-13). This interaction is interrupted by Boy 1 who repeats the big question (14) and Boy 3 repeats the beginning of the question (15). Then, Boy 1 dictates again the first two words of the question (16) and Boy 3 criticizes Boy 2 for not being able to spell the word “Light” (17) *(Question Typing)*. Then, Boy 1 makes a joke that makes Boy 3 -scribe- upset and makes Boy 2 laugh (18-21). Typing is resumed (22) while

Boy 3 repeats a portion of the big question and finally Boy 2 tells the scribe to make sure he types, “With wind” and asks him to press “Enter” (26).

This is a typical segment of the category *Question Typing*. There is some struggle that defines who holds the mouse, types the question, dictates (5-13), and a person in the team who brings the attention back to typing the question (14-26). Different interactions for typing the question were observed: one person types the question while the rest of the group helps or waits, someone types parts of the question then gives the mouse or keyboard to someone else in the group. In almost all audio-recordings, someone in the group corrected the scribe whenever she/he made a mistake, but also, while scribe typed, other participants are heard chatting about unrelated topics, waiting for the first searches to appear on the screen.

Second, groups read the information in accessed links *(Link Comprehension)* and discarded/read others *(Discard Link)*, then clicked on a link believed to contain the answer to the question *(Use Link)*. This process is exemplified in session 6:

1	**Boy 3**	Oh. You gonna have to pay for it. Click it!
2	**Boy 2**	No, that's all right.
3	**Boy 3**	Yo! What?
4	[Singing]	
5	**Boy 2**	Better turbine. No, it's not the answer. Make it small one. No. You gotta go to two. Why doesn't it never gives us the real answer? We have to always search it up ourselves.
6	**Boy 3**	Yeah. It always talking about butt faces like...
7	[Chuckles]	
8	**Boy 2**	Slow, slowly.
9	**Boy 3**	No.
10	**Boy 2**	A light bulb just for that much money? Mama be like, "Hey!" Which one?
11	[Making noises]	
12	**Boy 2**	I was like...
13	[Laughter]	
14	**Boy 3**	I already be like...

Transcript 3.2 Group discussing and discarding links in session 6

This segment begins when a page of several links shows on the screen. These links include pictures, website links, and links to shopping websites. First, there is a discussion about the information in the link *(Link Comprehension)*, which shows how students are quickly trying to comprehend the information by exchanges of a few words and silently reading the information (1-3). Although curious about the

information, Boy 2 refuses to click on a link (2) that would not lead to answer the question *(Discard Link)*. Then, participants quickly read information and recognize that this link does not have the answer either *(Link Comprehension and Discard Link)* with a reflection about the difficulty of finding an answer to the question (5-7). The group search continues when Boy 2 scrolls down the page (8) but they quickly discard the information by quietly reading the links *(Link comprehension and Discard Link)*. Finally, participants discuss the information in a jokingly way and discard the links *(Link Comprehension and Discard Link)* (10-14).

This is a typical segment for *Link Comprehension* and *Discard Link* showing how participants quickly move through the information when looking for one suiting the needs of the big question (1-3; 5-7; 10-14). However, the interactions among the students are typical of this group: they are all boys who know each other already, therefore a history of friendship but also disagreements and at times arguments is reflected on how they treat each other. For instance, at the beginning of the interaction there is an argument about how one student talks to the other one, but this is quickly forgotten when a third student repeats the big question. These boys also joke and talk about family while performing the searches. This interaction seems unideal to an outsider; however, this constant tensed-relaxed relationship moves the search for an answer forward.

In other sessions, participants followed a similar process: reading silently then discarding link, reading aloud a part of the link, then discarding it or discussing its information with other teammates. Sometimes, this process went on for several or a few exchanges depending on how participants taught the link suited the big question, and usually culminated with participants choosing a link by clicking on it. In the case when groups could not make a choice, the question was rephrased and typed to obtain better links.

Third, once on a website, participants read information either silently or aloud and discussed to comprehend it *(Website Comprehension),* then, they would decide to use *(Use Website Information)* or discard the information *(Discard Website Information)*. In the following segment from session 12, participants are reading then discussing how the answer pertains to the question:

[Mouse click]

1	**Boy 3**	Why can you just let me try to find a better answer?
2	**Boy 1**	Holly crap!
3	**Girl 2**	It has six answers! [Pause] "Does liquid electricity conducts better than metal? Medals? Metals? Materials? Middles?
4	**Boy 1**	Press zoom.
5	**Boy 2**	Metals!
6	**Girl 2**	Metals.
7	**Girl 2**	"I'm doing, a fifth grade, a fifth-grade scientific project on this and, and just need, and just need, on this and just need some".
8	**Boy 2 & Boy 1**	"Pointers".
9	**Girl 2**	"On how to get started. I have to write a page, a two page report, and I just have" [Pause] Oh no! [Yells] This has nothing! Nothing. I tell you! Nothing!
10	**Boy 1**	You have to click harder.
11	**Girl 2**	He is talking about the science fair and we are talking about our question. This is not helping us at all.
12	**Boy 1**	Okay. Go back. Go back.
13	**Boy 2**	Oh my god!

Transcript 3.3 Group analysing website information to use or discard in session 12

In this segment, students are already reading through the information in a website, when they realized that it is offering six answers to the question (2-3). A girl is reading aloud a question as presented in the website to the group and when she miscues a word, someone helps her reading it (3-6). Then, the girl reads an answer aloud and realizes that it is unrelated to the big question *(Website Comprehension)* (7-11). When she complains, the group discards the website *(Discard Website)* (11-13).

In this typical comprehension segment, the girl is the one reading and explaining the information while the boys do not object to her reasoning and agree in a few words to discard the website. The emphasis on the girls' voice and Boy 1's expression of surprise shows understanding and perhaps bring the groups' attention to carefully reading the information to understand why the boy and the girl are surprised. Then, the girl was certainly disappointed -as she raises her voice- because the information she reads is unrelated to the big question. She made such emphasis in this mismatch of information that her teammates quickly discard the website and verbally agree with her.

In other sessions, students had strong arguments about the information before using it to answer the big question or thinking aloud of each group member to hear, which usually led to make decisions about the information. Other groups, just read silently

and quickly agreed to use/discard the information with a “No, not it” or just “No” and a move of the mouse to scroll down the page. Usually, groups made decisions together about discarding a website. In other cases, one team member made the decision for the group and this had consequences such as arguments, further explanations as for what the information was useful, and sometimes a return to the website.

Fourth, if the group agreed that the website provided information that answered the question *(Use Website Information)*, they would either write down an answer *(Write Answer)* or announced that despite finding an answer, they would like to look for more information *(Find More Information)*. If the information was unhelpful, they would discard the website *(Discard Website)* and start a new search by typing the question or a rephrased question or by reviewing previous links. In session 8, three girls have navigated a few links and websites, agreed on partial answers and rephrased the question to find more information. In this segment, they have found a possible answer to the question and they have re-read the information several times before making a choice. Finally, Girl 1 calls the researcher to let her know they found an answer

1	**Girl 1**	Woman, we found the answer.
2	**Woman**	Okay.
3	**Girl 3**	It says. It says, "Surprisingly, is the lemon. It has more acid, so that's why. The pH thing in it..."
4	**Girl 2**	What pH means?
5	**Girl 3**	"Go to electricity dot com to seek better answers".
6	**Girl 1**	I don't think so. We have the better answer.
7	**Girl 2**	Let's try some more. More acid.
8	**Girl 1**	Wait, wait, wait. There you have it.
9	**Girl 2**	More acid. Acid everywhere.
10	**Girl 1**	Yeah, because it has more acid.
11	**Girl 2**	"And the potatoes. Potatoes' natural".
12	**Girl 1**	Can we get the paper?
[Sigh]		
13	**Woman**	What is the answer?
14	**Girl 3**	The answers is because it has...
15	**Girl 2**	The lemon has more acid.
16	**Girl 3**	The lemon because it has more acid and it makes the light brighter.
17	**Girl 2**	Yes. And the potato...
18	**Woman**	But why? Why the acidity makes it brighter?
19	**Girl 2**	The potato is not that bright because it doesn't have acid in it.
20	**Girl 1**	It doesn't have as much, as much acid as the lemon.
21	**Girl 3**	Because it doesn't have as much acid as the lemon.
22	**Girl 2**	Thank you.
23	**Girl 3**	"Surprisingly is the acid. It’s the lemon because it has more acid. The pH thing"
24	**Girl 2**	The pH goes to like somewhat.

25	**Girl 1**	What's the pH thing?
26	**Girl 2**	Somewhat. It doesn't tell us why.
27	**Girl 1**	It doesn't tell us what a pH is.
28	**Girl 2**	It doesn't tell us why.
29	**Girl 3**	So, we have the first answer. Now we need the second answer.
30	**Girl 1**	The second part to answer the question. Yeah!
31	**Girl 2**	So keep that in mind.
32	**Girl 1**	Okay.
33	**Girl 2**	One, two, three...
34	**Woman**	Let me give you the paper so you can write the answer.
35	**Girl 2**	Oh! Right here. Oh my!
36	**Girl 1**	I'll write. I'll write.

[Chatting on the background]

Transcript 3.4 Groups deciding to use information in a website and planning on further searches

The group acknowledges the answer (1-3) by reading it to the researcher *(Use Website Information)* but immediately, a girl questions the word pH (4) and this is ignored by girl 3 who reads more information in the website (5) to which girl 2 reacts (6) by refusing to go to the offered website (Discard Website). Then, an idea related to the word acid takes the group to decide that it is the right answer (7-11) and choose the information (12) as the answer to be written on paper *(Use Website Information)*. However, upon requesting the paper, researcher asks the group for the answer to the big question and they explain using the text and their own ideas (13-23). Finally, this brings the group back to the word pH, which they ignored before (4), and they talk about how the word is in the text but they do not know the meaning and therefore they just have one part of the answer and need to find out the meaning of the word to be able to answer the big question completely *(Find More Information and Write Answer).*

This segment shows one way a group decided on an answer and planned to find more information. Other groups decided on the by making several mistakes before figuring out that one word could change the meaning of an answer and therefore, they struggled to find the answer to the question. There were groups for which a partial information was sufficient to answer the big question, while in other groups, information from other SOLE sessions were recalled to comprehend and answer the big question. Nonetheless, in all 11 recorded sessions, discussions in the form of conversation, arguments, more questions, scrolling down pages, taking carful look at one-word, videos, images, and definitions allowed the group to make informed choices and understand the need to look for more information.

This cyclical process and its option paths were repeated until the session was over or participants wrote an answer to the question (See appendix E for a detailed description stages of SOLE).

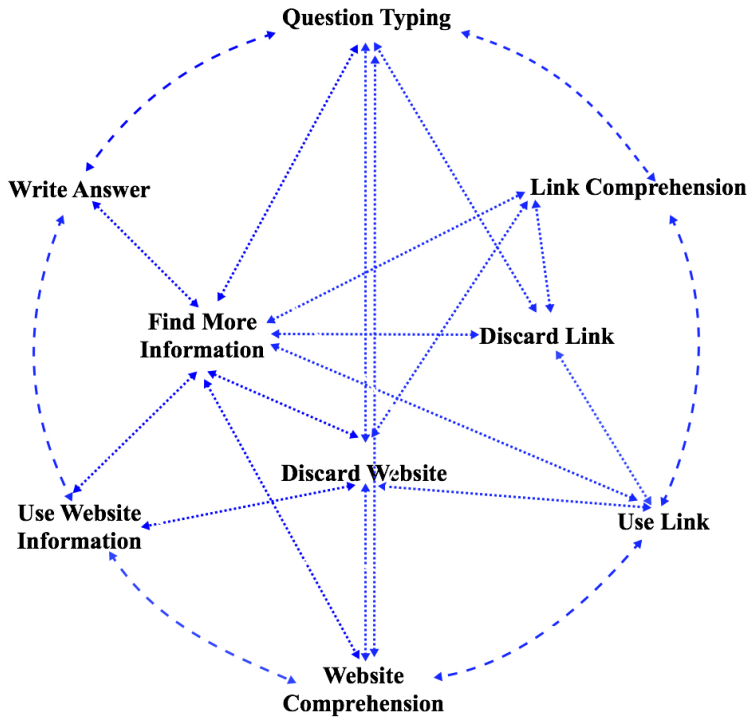


Figure 3.6 SOLE Cycle to Answer Big Question Revealed in First Macro Analysis

Micro Analysis: Interaction Analysis of Internet Comprehension Segments

However, a closer look at the data showed that some students would not access the same links and websites after they had discarded them, unless they stated a reason for doing so, which indicated the possibility that participants were learning from the Internet searches they performed. This second analysis was done under the views of Complexity Theory (Morrison, 2006) and Connectivism (Siemens, 2005) while asking the question: "How are participants using information accessed during the cyclical process?" This revealed that participants were in fact not using information they had discarded unless they had a strong reason for doing it. In the following sample, Girl 2 is considering looking for a better answer to the question elsewhere, implying that they have already found an answer and Girl 1 agrees to this, but immediately, Girl 2 states that if they cannot find better information, they can always return to this same page:

Girl 2 But let's see if there is better answers.
Girl 1 In a better place.
Girl 2 But if not, let's go back on this one and say [Inaudible] [06:43].

After this second analysis, it was noted that the linear cyclical process first described was representative of a closed system that did not portrait events as the one described above, in which a group acknowledges comprehension of information that will be used to answer the question but further looks for information. This implies that the group has learned something about the answer, which exist in a space (i.e. website) and will be used in a future time. This space/time relationship is described in Complexity Theory and Connectivism to identify how knowledge and learning is an emergent feature of highly connected networks that occurs in space and time where a history of instances is built between individuals and artefacts (Siemens, 2005; Davis and Sumara, 2006).

It was decided then, that a new graphic representation should be created to suit the needs of the data. The analogy of a self-organising tree (Figure 3.7) was used for this purpose: Read from bottom to top (i.e. emergent system), the big question was identified as the *source of perturbance* (Morrison, 2006) or element source that triggers self-organisation, represented here as the tree's trunk where all evolving efforts stem from and return to. The elements identified in the cyclical process (i.e. question Typing, Link Comprehension, etc.) were classified as emergent behaviour as opposed to a set of predetermined steps that participants had to follow to answer the question. Each branch represents the emergence of a new *event* from the need to answer the big question and in response to elements found in the Internet (i.e. artefacts of interaction: Links, texts, pictures, etc.). As time passed and participants moved through different spaces (i.e. searches on the Internet), new branches were formed in new and higher spaces in the trunk, indicating participants self-evolution and therefore, learning. The presence as opposed to the disappearance of the lower branches in the graph shows the ability of groups to recall links and visited websites to further use the information to answer the question. However, once they returned to same websites and links, this represented a new *event,* since they performed the second search with knowledge of the content acquired before.

This tree analogy is a better representation of an open system with limits bound to the big question shown inside the brown bracket: closed at the bottom (Organizationally closed) to show the initial state when the question is asked and opened at the top to represent continued self-organisation processes since it isn't clear when this process stopped or will stop. Although outside the scope of this thesis work, it could be further

argued that the roots of the tree are also part of this self-organising system since participants did not come to the SOLE labs as "clean slates" or "empty vessels' but with knowledge, content and skills that contributed to answering the question.

The *event* behaviours (i.e. branches) -green and blue colours- are used to distinguish two types of behaviours: Green titles are *nested event behaviours* emerging to advance a search in the Internet, while the blue titles emerged when groups transition in space (i.e. to links, a new search, a new website), making a reference to the big question, that is, they started a new search because the current one did not satisfy their needs or because they wanted to acquire more information. The branches represent how ambiguously bounded is the system that allows for branches to form or self-organise in different and complex ways. Finally, the light dotted lines without directional arrows indicated two things: straight lines stemming from the question shows the beginning of an *event*, while the winding lines are the connections between the *nested event behaviours* to indicate the advancement of the search for an answer through Internet comprehension (i.e. passage of time) and the navigation through links, pages, pictures, videos, news articles (i.e. change of space) that is hardly ever a straight forward process. In contrast, the bolded dotted lines with an arrow pointing back to the big question indicates that participants either exhausted a search or were trying to find further information by referencing back to the big question.

In regard to network connectivity, the tree representation shows a highly connected system with nodes of connection at different levels, while no element is left unconnected to the system. The source of perturbance created nodes of connection (Siemens, 2005), that allowed participants to explore information related and unrelated to the question, visible in the connection between the big question and the events. The nodes between nested events of behaviour were strengthen by the big question too, as the complex system of participants and artefact (e.g. Internet, mouse, TV screen, etc.) constantly occurred in the quest to solve the big question. Finally, this connectivity allows participants to explore such a vast system of information as the Internet: Participants and artefacts continuously assisted each other in the navigation of information, which will be clearly exemplified in the ensuing chapter.

Finally, in this thesis work, only one tree analogy was selected with a simple chain of events to show the broad picture of a SOLE session. However, if we placed this tree in a forest, other trees would represent either other SOLE sessions with different or related questions of systems that might stem from the original tree (e.g. connected through roots). The forest would represent a complex system nesting other complex systems. In

addition, events on each tree also nest other systems. In the next chapter, the nested system for information comprehension is analysed to answer the main research question. Finally, this forest analogy and its nested systems should be extended to other investigations, to better describe SOLE as a complex system.

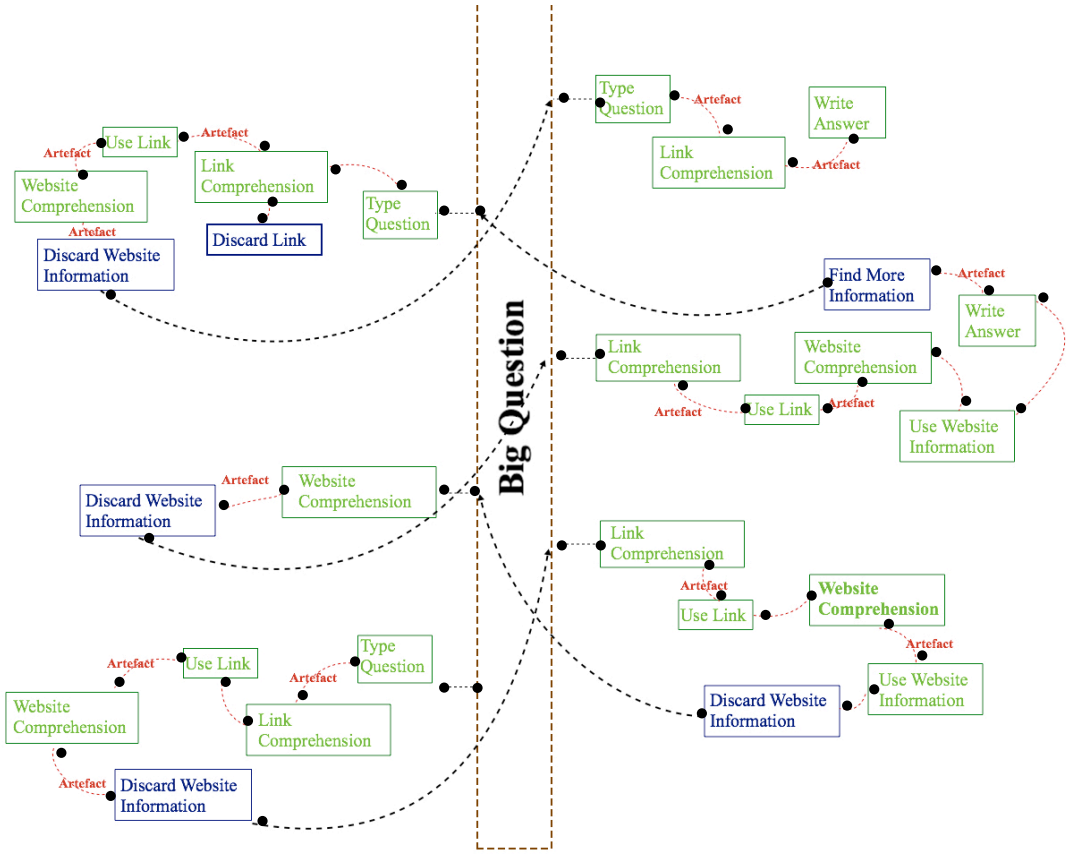


Figure 3.7 Graph of a Complex System in SOLE

Graph legend:

	Brown bracket with opening at the top	Source of perturbance: Big question
Type Question	Green rectangles and words	Event of Interaction
Discard Web...	Blue rectangles and words	Element of transition of events
Artefact	Red word: Artefact	Artefacts used to transition between events/segments
----------	Black straight dotted line	Event begins
	Black curved dotted lines	Connected events containing artefacts

	Bold curved dotted lines with arrow point	Transition from event to event
	Black dot	Node of connection for each element of the complex system

After establishing the broad self-organising system of Internet searches and comprehension for SOLE, nested systems (Davis and Sumara, 2006) within the branches related to Internet comprehension were chosen to answer question 3 of the study. Since SOLE is considered a complex system (Mitra, 2014b), segmentation of these interactions was carefully done to preserve structures that could potentially answer the research question. That is, event behaviours such as Choose/Discard Link and Choose/Discard Website usually happened within Link Comprehension and Website Comprehension stages, making it counterproductive to segment these events. When participants made the decision to choose or discard a link/website, it was noted yet not segmented in the analysis to preserve the structure of the event interaction.

These nested comprehension episodes were reviewed by answering the question: "What were participants doing to comprehend information found on the Internet?" and participants' actions were labelled using short statements. These labels were necessary for a better understanding of the data since participants' behaviours oscillated between a social and then cognitive nature.

After careful analysis, each label was classified into one of these categories: reading mode, decoding skills and strategies, social skills and strategies, and cognitive skills and strategies. However, at times participants' actions could be interpreted as both social and cognitive in nature due to the co-dependency found when solving big questions and complex online texts. Reading mode and decoding skills were considered cognitive skills, but they were coded under their own category because of the impact on comprehending information and their prevalence in the data. Finally, other categories could have been included, however, only those concerned with Internet comprehension were considered to facilitate data analysis and answer research question.

Categories were carefully defined to prevent confusion:

Reading mode refers to how participants choose to read information: silently or aloud.

Decoding skills and strategies refer to how participants converted written symbols found online, that is, decoding with miscues, corrections to miscues, auto-corrections, etc.

Social skills and strategies are those facilitating communication and interaction (e.g. pointing out information, acting surprised in understanding).

Cognitive skills and strategies are related to processes for understanding information and used for attention, memory, critical analytic ability, inferencing, and visualization (RAND Reading Study Group, 2001).

These definitions were applied to the microanalysis of data presented in Chapter 4. The following figure shows a summary of the process followed to analyse Internet comprehension data:

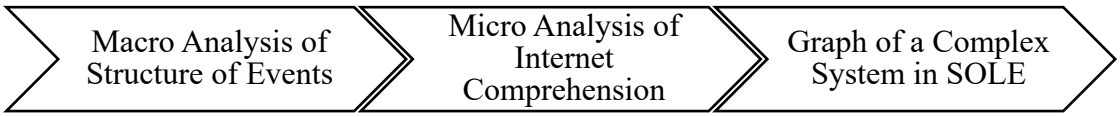


Figure 3.8 Summary of Process Analysis of Data for Question 3

3.6 Ethical considerations

This study abided by the Department of Education of New York City Committee for Research Approval (CRA), the Responsible Conduct Research (RCR) of the United States and Newcastle University's guidelines for research ethics. In this section, ethical risks and solutions are explained.

3.6.1 Ethical risks and planned solutions

The most important ethical consideration was participants were 9 to 10-year-old students and thus without ability to provide informed consent of participation. School principals and parents were informed, and approval obtained while consent was given by children. Deception was not used.

In order to alleviate this ethical risk, permission was obtained from Newcastle University and the Institutional Review Board of New York City prior to approaching schools. Full ethical proposals ensured review of research materials: permission, consent and assent letters, and data collection materials. A plan was also made for data

de-identification, handling and disposal of identifiable information. Finally, the review board requested a report of the results of the study. Then, schools offering fourth-grade education were identified and information letters were sent to school principals.

Information letters to families indicated rights and responsibilities, explaining purpose, expectations, benefits, time, and cost of the study. It was made clear that participation was voluntary and that decision to participate would not influence students' grades. Families were made aware that students without parental/legal representative consent would not be allowed to participate in any of the activities set forth by this study. The letter was provided in language of preference, upon family request. Researcher provided contact information (i.e. phone number and email address) for all families seeking clarification, assistance or more information regarding the proposed activities. Informative meetings were offered but school principals and the Department of Education declined participation, as these meetings would have burdened schools.

As for the participants, assent in the written form was sought during an information meeting in which the activities involved were clearly explained. Following a script approved by the Department of Education, students were introduced to the study in developmentally appropriate terms. Time was given for questions and answers and participants were made aware of the voluntary nature of the study. Then, participants were asked to sign an assent form agreeing to participate and to be audio recorded. For all activities described above, the researcher was the only person meeting the school principals, families and children and entering schools to perform research activities.

This study collected identifiable data that had the potential to compromise participants' identities. Data collected in testing was de-identified upon collection. Participants' names were kept in a password-protected computer and only coded information was used. Audio recordings were also protected. Internet use was watched, and access was only granted with appropriate firewalls. Nonetheless, the researcher constantly monitored Internet use in order to prevent undesired outcomes.

3.6.2 Benefits of participation of this study

A reading approach based on reading challenges, peer collaboration, and Internet use benefits the diverse population of New York City because it supports 21st century learning skills and Common Core Learning Standards while providing a safe

environment for students to practice offline and online reading. According to Casner-Lotto and Barrington (2006), the most important skills to succeed in the workplace are collaboration, communication, and reading. The present study highly supports both enterprises: academic achievement and collaborative learning for New York City students to succeed.

Also, evidence from Jackson and collaborators (2006; 2011) indicated that Internet use increases reading comprehension especially for struggling readers. Moreover, Coiro and colleagues (2007; 2011) showed that offline and online reading skills although similar, differ in sophistication and use of critical thinking skills essential for online reading comprehension. These studies promoted online reading practice in collaborative groups as a way to access these new skills. This benefited participants by fostering opportunities to practice reading, collaboration, Internet search skills, and problem solving.

Chapter 4. Findings

The purpose of this study was to answer the question: How do fourth-graders of New York City comprehend Internet information to answer big questions in the Self-Organised Learning Environment (SOLE) sessions? In this section, findings derived from the analysis are presented to answer all research sub-questions. The findings are presented according to phase.

4.1 Findings for phase 1

Findings in phase 1 addressed whether fourth-graders 1) obtained better reading scores in individual reading of eighth-grade texts as opposed to group reading eighth-grade texts using the Internet and 2) obtained better reading scores in group reading of fourth as opposed to eighth-grade texts using the Internet. Data was collected from 58 students from two different schools in New York City and all students participated in all three conditions.

This analysis included descriptive statistics, test of homogeneity, a one-way ANOVA, and a post-hoc analysis. This determined if there was a statistically significant difference within and between means of all three reading conditions. In the analysis, 8th Grade, Individually referred to reading eighth-grade texts individually without Internet support; 8th Grade, Group denoted participants reading in groups, eighth-grade texts with Internet access; and 4th Grade, Group referred to group reading fourth-grade texts with Internet access.

4.1.1 Descriptive statistics for questions 1 and 2

Hypothesis in null form for sub-question 1 was: fourth-graders of New York City public schools will not display statistically significant difference in comprehension levels when reading eighth-grade texts individually compared with group reading with Internet access for research support as measured by the scores obtained on text comprehension questions. Hypothesis in null form for sub-question 2 was: Fourth-graders of New York City public schools will not display statistically significant difference in comprehension levels when reading in groups with Internet access for research support of fourth-grade texts compared with reading eighth-grade texts, as measured by the scores obtained on text comprehension questions.

Descriptive statistics were used to uncover mean score differences. This analysis included means, standard deviations, standard errors, confidence intervals at the 95% level and its minimal and maximum scores of each text and condition and then for the sum of texts per condition. The results are reported in Table 4.1.

Measure	N	Mean	SD	SE	95% CI		Min. - Max.	
Text 1								
8th Grade, Individually	48	0.396	0.574	0.083	0.229	0.562	0	2
8th Grade, Groups	45	2.022	1.288	0.192	1.635	2.409	0	4
4th Grade, Groups	25	2.680	1.435	0.287	2.088	3.272	1	5
Total	118	1.500	1.443	0.133	1.237	1.763	0	5
Text 2								
8th Grade, Individually	42	1.357	0.983	0.152	1.051	1.664	0	4
8th Grade, Groups	41	3.341	1.797	0.281	2.774	3.909	0	7
4th Grade, Groups	36	3.583	1.888	0.315	2.945	4.222	0	8
Total	119	2.714	1.874	0.172	2.374	3.054	0	8
Text 3								
8th Grade, Individually	46	1.065	0.533	0.079	0.907	1.224	0	2
8th Grade, Groups	49	2.286	1.099	0.157	1.970	2.601	0	3
4th Grade, Groups	49	3.531	1.340	0.191	3.146	3.916	1	7
Total	144	2.319	1.452	0.121	2.080	2.559	0	7
Text 4								
8th Grade, Individually	51	0.902	0.944	0.132	0.637	1.167	0	3
8th Grade, Groups	52	3.596	1.209	0.168	3.260	3.933	1	6
4th Grade, Groups	28	2.929	1.464	0.277	2.361	3.496	1	5
Total	131	2.405	1.695	0.148	2.112	2.698	0	6
Text 5								
8th Grade, Individually	49	0.714	0.736	0.105	0.503	0.926	0	3
8th Grade, Groups	51	4.020	1.530	0.214	3.589	4.450	1	6
4th Grade, Groups	31	2.968	1.798	0.323	2.308	3.627	1	7
Total	131	2.534	2.001	0.175	2.188	2.880	0	7
Text 6								

8th Grade, Individually	43	0.302	0.599	0.091	0.118	0.487	0	2
8th Grade, Groups	39	3.538	1.072	0.172	3.191	3.886	2	6
4th Grade, Groups	24	3.500	2.904	0.593	2.274	4.726	0	7
Total	106	2.217	2.221	0.216	1.789	2.645	0	7
8th Grade, Individually	58	3.931	2.790	0.366	3.197	4.665	0	15
8th Grade, Groups	58	14.466	4.239	0.557	13.351	2.409	5	23
4th Grade, Groups	57	13.018	5.537	0.733	11.548	14.487	3	27
Total	173	10.457	6.362	0.484	9.502	11.411	0	27

Table 4.1 Descriptive statistics for texts and reading conditions

At first glance, these results showed differences in means for each text and overall conditions. For instance, mean scores for 8th Grade, Individually ranges from 0.302 to 1.357 while the mean scores for 8th Grade, Groups ranges from 2.022 to 4.020, showing that 8th Grade, Individually highest mean score is lower than the lowest mean score for 8th Grade, Groups condition. Similarly, 8th Grade, Individually highest mean score is lower than the lowest mean for 4th Grade, Groups condition. Further analysis was needed to uncover if such differences were statistically significant.

4.1.2 Homogeneity of variance

Homogeneity of variance was conducted to test if all groups had the same or similar variance associated with each ANOVA. Table 4.2 indicated statistical significance in all cases with the exception of Text 2 outcome $p = .071$, which exceeds the .005 alpha level. These results indicated that assumption of homogeneity of variances was violated in all remaining cases, while this was not violated in the aforementioned case. Based on these results, a post-hoc analysis was conducted on the basis of whether or not this assumption was violated. In cases where statistical significance was found in this current test, the Games-Howell post-hoc analysis was conducted, as this test does not incorporate the assumption of homogeneity of variances. In Text 2, which statistical significance was not indicated, Tukey's HSD was used instead, as this test incorporates this assumption, which was not violated in this case.

Measure	**Levene Statistic**	**df_1**	**df_2**	**p**
Text 1	14.645	2	115	.000

Text 2	2.712	2	116	.071
Text 3	22.787	2	141	.000
Text 4	6.060	2	128	.003
Text 5	11.054	2	128	.000
Text 6	76.876	2	103	.000
8th-grade, Individually	11.691	2	170	.000

Table 4.2 Levene Statistic

4.1.3 One-way analysis of variance

A one-way ANOVA was used to determine if a statistically significant difference existed between independent variables: reading eighth-grade text individually as opposed to eighth-grade texts in groups with Internet access and between reading fourth versus eighth-grade texts in groups with Internet access.

As shown in Table 4.3, statistical significance at the .001 alpha level was indicated in all cases, showing that these outcome measures significantly differ based on group membership, which were categorized as 8th-grade, Individually; 8th Grade, Groups; and 4th Grade, Groups. Thus, for text 1 F(*df* 117) = 44.034; text 2 F(*df* 118) = 23.838; text 3
F(*df* 143) = 64.792; text 4 F(*df* 130) = 71.158; text 5 F(*df* 130) = 74.855; text 6 F(*df* 105) = 54.044; 8th-grade, Individually F(*df* 172) = 100.762. However, it is noted that the ANOVA only showed mean difference between and within groups, and that a posthoc analysis was needed to uncover differences.

Measure	**Sum of Squares**	**df**	**Mean Square**	**F**	**p**
Text 1					
Between Groups	105.603	2	52.802	44.034	.000
Within Groups	137.897	115	1.199		
Total	243.500	117			
Text 2					
Between Groups	120.673	2	60.337	23.838	.000
Within Groups	293.612	116	2.531		
Total	414.286	118			
Text 3					

Between Groups	144.297	2	72.149	64.792	.000
Within Groups	157.008	141	1.114		
Total	301.306	143			
Text 4					
Between Groups	196.671	2	98.336	71.158	.000
Within Groups	176.886	128	1.382		
Total	373.557	130			
Text 5					
Between Groups	280.647	2	140.324	74.855	.000
Within Groups	239.948	128	1.875		
Total	520.595	130			
Text 6					
Between Groups	265.247	2	132.624	54.044	.000
Within Groups	252.762	103	2.454		
Total	518.009	105			
8th-grade, Individually					
Between Groups	3775.787	2	1887.894	100.762	.000
Within Groups	3185.138	170	18.736		
Total	6960.925	172			

Table 4.3 ANOVA: Analysis for Between/Within Groups Differences

4.1.4 Post-hoc analyses

A post-hoc analyses associated with these one-way ANOVAs was conducted (See Table 4.4). First, regarding Text 1, 2, 3, 4 5, and 6, the 8th-Grade, Individually was found to have significantly lower scores as compared to 8th-grade, Group and 4th-grade, Group in all aforementioned texts. However, regarding the mean comparison between 8thgrade, Group and 4th-grade, Group, in three out of six occasions, the mean for 8thgrade, Group was higher, yet not statistically significant different from 4th-grade, Group. Similarly, the mean for 4th-grade, Group was found to be higher in three out of six occasions but only statistically significant different from 8th-grade, Group in Text 3.

Finally, a post-hoc analysis was not conducted in relation to the Eighth Grade, Individual passage outcome due to the presence of only two categories of respondents with valid data. However, the descriptive statistics conducted indicated a significantly

higher mean with respect to the Eighth Grade, Groups category as compared with the Eighth Grade, Individually category.

Group I	Group J	Mean I-J	SE	P	95% CI	
Text 1 (GH)						
8th Grade, Individually	8th Grade, Groups	-1.626*	.209	.000	-2.129	-1.124
	4th Grade, Groups	-2.284*	.299	.000	-3.023	-1.545
8th Grade, Groups	8th Grade, Individually	1.626*	.209	.000	1.124	2.129
	4th Grade, Groups	-.658	.345	.149	-1.495	0.179
4th Grade, Groups	8th Grade, Individually	2.284*	.299	.000	1.545	3.023
	8th Grade, Groups	.658	.345	.149	-0.179	1.495
Text 2 (HSD)						
8th Grade, Individually	8th Grade, Groups	-1.984*	.349	.000	-2.814	-1.155
	4th Grade, Groups	-2.226*	.361	.000	-3.084	-1.368
8th Grade, Groups	8th Grade, Individually	1.984*	.349	.000	1.155	2.814
	4th Grade, Groups	-.242	.363	.784	-1.105	0.621
4th Grade, Groups	8th Grade, Individually	2.226*	.361	.000	1.368	3.084
	8th Grade, Groups	.242	.363	.784	-0.621	1.105
Text 3 (GH)						
8th Grade, Individually	8th Grade, Groups	-1.220*	.176	.000	-1.641	-0.800
	4th Grade, Groups	-2.465*	.207	.000	-2.962	-1.969
8th Grade, Groups	8th Grade, Individually	1.220*	.176	.000	0.800	1.641
	4th Grade, Groups	-1.245*	.248	.000	-1.835	-0.655
4th Grade, Groups	8th Grade, Individually	2.465*	.207	.000	1.969	2.962
	8th Grade, Groups	1.245*	.248	.000	0.655	1.835
Text 4 (GH)						
8th Grade, Individually	8th Grade, Groups	-2.694*	.213	.000	-3.202	-2.186
	4th Grade, Groups	-2.027*	.307	.000	-2.773	-1.280
8th Grade, Groups	8th Grade, Individually	2.694*	.213	.000	2.186	3.202
	4th Grade, Groups	.668	.323	.108	-0.115	1.450

4th Grade, Groups	8th Grade, Individually	2.027*	.307	.000	1.280	2.773
	8th Grade, Groups	-.668	.323	.108	-1.450	0.115
Text 5 (GH)						
8th Grade, Individually	8th Grade, Groups	-3.305*	.239	.000	-3.876	-2.734
	4th Grade, Groups	-2.253*	.340	.000	-3.083	-1.424
8th Grade, Groups	8th Grade, Individually	3.305*	.239	.000	2.734	3.876
	4th Grade, Groups	1.052*	.387	.024	0.119	1.985
4th Grade, Groups	8th Grade, Individually	2.253*	.340	.000	1.424	3.083
	8th Grade, Groups	-1.052*	.387	.024	-1.985	-0.119
Text 6 (GH)						
8th Grade, Individually	8th Grade, Groups	-3.236*	.194	.000	-3.704	-2.768
	4th Grade, Groups	-3.198*	.600	.000	-4.695	-1.700
8th Grade, Groups	8th Grade, Individually	3.236*	.194	.000	2.768	3.704
	4th Grade, Groups	.038	.617	.998	-1.492	1.569
4th Grade, Groups	8th Grade, Individually	3.198*	.600	.000	1.700	4.695
	8th Grade, Groups	-.038	.617	.998	-1.569	1.492

Table 4.4 Post-hoc Analysis

The results allowed for the rejection of null hypotheses for research sub-question one: fourth-graders of New York City public schools will not display statistically significant difference in comprehension scores when reading eighth-grade texts individually in comparison to group reading with Internet access for research support as measured by scores obtained on text comprehension questions. Results favoured reading in groups of eighth-grade texts with Internet support, since in all measures participants obtained higher scores.

In contrast, results did not allow for the rejection of the null hypotheses for research sub-question 2: fourth-graders of New York City public schools will not display statistically significant differences in comprehension scores when reading in groups with Internet access for research support of fourth-grade texts in comparison to reading eighth-grade texts, as measured by scores obtained on text comprehension questions. Results did not favour either condition.

4.2 Findings for phase 2

In this phase, findings for question 3 were addressed: What do fourth-graders in New York City do to comprehend Internet Information when asked to solve a big question during SOLE sessions? In Chapter 3, an Interaction Analysis (IA) first revealed that participants followed a cyclical linear process when answering SOLE questions (Figure 3.1). However, a second look at the data showed that this apparent linear cyclical process was actually a complex system in which certain behaviours emerged when participants navigated Internet information. This complex system was graphically represented using a tree analogy (Figure 3.7), in which a group of events and segments of behaviour formed the branches or events of interaction. Then, several events of interaction or branches were graphed to portrait how participants built a history in space and time that was irreversible, incompressible and from which participants learned to perform subsequent Internet searchers. It was explained how this complex system was strengthen by the connections (i.e. nodes) between the big question, participants and artefacts.

Complexity Theory (Davis and Sumara, 2006) states that one of the characteristics of complex systems is that they are nested in other complex systems or they have nested systems within themselves. Therefore, it was decided to analyse nested systems where Internet comprehension was most evident in all ten audio recordings in order to answer question 3. Findings of this final analysis are represented here in three SOLE sessions. The first two sessions (Session 8 and 12) show typical events in which participants formed networks to comprehend links and websites while the third account (Session 14) provides insight into a deviant case (Schegloff, 1968) where a group struggled to comprehend information. Findings are presented for each session in two parts: data and then its analysis (See Table 4.5 for a summary of analysis of events).

Data was presented in a table containing a transcription of a segment corresponding to the session, skills and strategies of each interaction, part of an observation, and the screenshot for each segment. Then, a summary of skills and strategies found in the segments were grouped into four categories in order to show the most influencing elements participants used to comprehend Internet information.

The structure of analysis for each segment had three parts: analysis of participants' interactions, analysis of interactions with artefacts, and interpretation of the two

analyses. Analysis of participants' interactions included conversations leading to information comprehension, while analysis of interactions with artefacts was a description of interactions between participants and artefacts (e.g. TV screen, texts, links, window message, mouse, keyboard, etc.) that affected interactions. Using elements of Complexity Theory (Davis and Sumara, 2006) and Connectivism (Siemens, 2005), interpretation of interactions was a brief synthesis and explanation of what participants did to comprehend in addition to a graphic representation of each segment.

Data	Transcription of audio recordings
	Observation
	Screenshot
	Summary of skills and strategies
Analysis	Description of participants' interactions
	Description of participants' interactions with artefacts
	Interpretation
	Graph
	Summary of events

Table 4.5 Summary of Analysis of Events

The *Macro Structure* (Jordan and Henderson, 1995) of each session began with three scheduled SOLE sessions per week of 45 minutes each during school hours. All sessions began with participants gathering in meeting area to review SOLE rules: 1) find a group to share a TV and answer the big question; 2) you can switch groups at any time; 3) you can see what other groups are doing and report back to your group; 4) present your findings in written form. The big question -written on a whiteboard visible to everyone- was read to the group. Next, participants selected their own group and a TV station. Sometimes, participants wondered around the room looking at the already formed groups until they found one of their like, however, most students routinely found a group within less than a minute and proceeded to research the big question. Then, researcher collected data from one group per SOLE session by sitting next to the TV, taking notes, placing a recording device on the table and taking screenshots as participants navigated from screen to screen. The Smart TV's size allowed researcher to see the information displayed in all TVs and therefore, the researcher could easily supervise participants. After 20–25 minutes of Internet research, participants gathered

in the meeting area to share findings, which they wrote on a given piece of paper. All sessions were conducted in the same manner without interruptions to the flow, except for session 7 when a visitor to the lab interacted with the participants for a few minutes.

4.2.1. SOLE Session 8

The participation structure of interaction (Jordan and Henderson, 1995) for this session was defined by the big question: "What conducts electricity better: a lemon or a potato? Explain." Since questions were asked in clusters related to the same topic (i.e. electricity in this case), the following questions were asked before session 8:

Session 4: What is a dynamo and how does it work?

Session 5: How does a dynamo generate energy?

Session 6: How to power a lightbulb with wind?

Session 7: How can you generate electricity with potatoes?

Therefore, participants had already been working on understanding the concept of electricity from different points of view. They researched topics such as dynamos, lightbulbs and wind generated electricity through all the offerings in the Internet: pictures, texts, videos, news, etc. In addition, classroom teachers had been teaching the topic of electricity from its main components: definitions and applications. This was done through direct teaching/teacher centred approach. Once the study was done, the teacher set-up experiments in the classroom related to electricity and magnetism.

The observed group was already acclimated to the SOLE format, rules, questions, typing, handling the mouse, taking turns to navigate information and collaborating. The group was self-selected, and it remained unchanged for this session. It was observed that the same participants had chosen each other in previous sessions and subsequent session, making collaboration a routinely activity for them. In other informal situations, it had been observed that participants were playground friends, they ate together in the cafeteria and overall, they were considered well-behaved students in the classroom as mentioned by teachers. These participants reading abilities were considered almost up-to-part with expectations for the fourth-grade in New York City. There were not English learners and they were not receiving special education services. During this session, participants did not walk around the room to see others' work (Rule 3) but some members interacted with a neighbouring group at some point.

This segment was chosen for three reasons: It clearly showed how participants formed and abandoned several networks to overcome a challenge that resulted in

comprehension, which was important to answering the research question. Also, this interaction revolved around a two-word answer, demonstrating the importance of analysing online information regardless of its complexity. Lastly, the group demonstrated how the lack of control over interactions and artefacts allowed them to flawlessly overcome this challenge, which is required for self-organisation to occur. Table 4.6 shows the transcription of the audio recorded event for session 8, observations and screenshot of the website visited by the group. Then a description of these data is provided for participants interactions and artefacts. Lastly, interpretation of analysis and a graphic representation are given

Transcript	Type of Skill or Ability	Observation	Screenshot
[The scribe typed the question in www.answers.com's browser and clicked Enter. The page loaded up slowly]		Girl 2 and Girl 3 read the links provided in www.answers.com. Girl 3 said, “I just saw it.” Then she added, “No, it is not.”	www.answers.com is a webpage for asking and answering questions. Answers are constructed in www.wikianswers.com, which is a page opened to the public and maintained by volunteers. Thus, the answer provided here came from a collective of people. In this particular page, participants accessed the question, “Which has more electricity a lemon or potato?” written in large font size. There was an ad followed by small pictures and a phrase indicating that this is a collective answer from the www.wikianswers.com. Then, there was the answer to the question, “A Lemon”, a phrase in smaller and lighter font saying, “3 people found 
Girl 2 “A lemon”. “A lemon” "How does"... okay.	Reading aloud		
Girl 1 I wish that person that put a lemon could put how, I mean like “why” is like...	Acknowledging answer and lack of information		
Girl 2 I don't know where I'm going. Can somebody do this for me?	Trouble, asking for help		
[Scrolling down the webpage with mouse]	Scouting for information		
Girl 1 Okay.	Repair, providing help		
[Scrolling down the webpage with mouse]	Scouting for information		
Girl 1 “Three people found this useful. A lemon.”	Reading aloud		
Girl 2 It does. A lemon. Useful?	Agreeing with a statement, reading aloud, reflecting on information		

Girl 1 It is really useful. It does tell us...	Agreeing with a statement, attempting to explain information
Girl 2 It tells us a lemon.	Acknowledging answer
Girl 1 It tells us a lemon. But...	Agreeing with a statement
Girl 2 But how? We put...	Interrupting explanation, providing a new idea, planning for a new search, rephrasing big question
Girl 1 It was useful but it...	Reaffirming statement, hinting at a partial answer
Girl 2 Listen to the question, again and put "why."	Interrupting explanation, providing a new idea, planning for a new search
Girl 1 Oh! Oh! Yeah!	Acting surprised in understanding, acknowledging and accepting idea
Girl 2 We just do why.	Restating idea
Girl 1 Okay. Now we just know a lemon.	Restating information learned
Girl 2 "Why does a lemon or a potato produce more energy?"	Rephrasing the big question, making a mistake, trouble
Girl 3 "Why does a lemon or..."	Attempting to rephrase the big question
Girl 2 "Why does a lemon or a potato produce..."	Attempting to rephrase the big question
Girl 1 No, no, no. No, no, no. "Why..."	Calling group's attention, rephrasing question
Girl 2 "Why does"	Rephrasing the big question

Girl 1 "A lemon or a potato"	Rephrasing the big question
Girl 2 You will help. Wait a minute.	Informing others about a plan
[Typing]	
Girl 1 "Why does a lemon generate more electricity than a potato?"	Correcting mistake, repair, rephrasing question

Table 4.6 Data for Session 8

Analysis

Description of Participants' Interactions

A network for analysing text quickly formed in response to a two-word text: Girl 2 read the answer aloud, "A lemon" (Reading aloud), and then tried to scroll down the page (Scouting for information). Girl 1 wished the answer had more information (Acknowledging answer and lack of information) and emphasised her wish to know the "How" instead of the "Why" to the big question (Planning a new search). Girl 2 expressed trouble scrolling down the page and asked for help (Asking for help, trouble). Promptly, Girl 1 grabbed the mouse and scrolled down the page (Providing help, repair).

While Girl 1 was helping Girl 2, a new network was formed for analysing text: Girl 1 read aloud (Reading aloud) that three people had found this answer useful and read the answer again (Reading aloud). Girl 2 agreed (Agreeing with a statement) that it was useful, then read the answer (Reading aloud) and questioned if it really was (Reflecting on information). Girl 1 reaffirmed the helpfulness of information (Reaffirming statement) and tried to explain how it was useful (Attempting to explain information) but she was interrupted (Interrupting explanation) when Girl 2 asked, "But how?" (Reflecting on information) and started to hint at an idea (Hinting at providing an idea). Girl 1 restated that the answer was useful (Acknowledging partial answer) and began to hint that it was just a partial answer (Hinting at a partial answer) when Girl 2 interrupted her to provide a new idea (Interrupting explanation, providing a new idea, planning for a new search, rephrasing big question).

After analysing the answer found in the text and acknowledging the need for a new question, the group abandoned this network to form one for planning a new search: Girl 2 interrupted to provide a new idea (Interrupting explanation, providing a new idea, planning for a new search, rephrasing big question). Girl 1 acted surprised in understanding (Acting surprised in understanding, acknowledging and accepting idea) and Girl 2 restated her idea (Restating idea) while Girl 1 restated information learned (Restating information learned). Girl 2 suggested a rephrased question, "Why does a lemon or a potato produce more energy?" (Rephrasing big question,) but mistakenly adding the word "or" exactly as in the original big question, replacing the word "conducts" for "produce" (Making a mistake, trouble). Girl 3 repeated the new question

as presented by Girl 2 (Rephrasing question, repeating mistake) and Girl 2 repeated (Rephrasing question, repeating mistake) to the scribe, who was already typing the new question. Suddenly, Girl 1 stopped the group yelling "No" several times, to dictate the word "Why", trying to show that she had a new idea (Calling groups' attention, providing an idea). Girl 2 and Girl 1 dictated the next words in the question to the scribe (Rephrasing question). Girl 2 reassured Girl 3 she was going to be helping them soon (Informing others about plan). Finally, Girl 1 read the entire new question correcting both of the previous mistakes (Correcting mistake, repair, rephrasing question), "Why does a lemon generate more electricity than a potato?"

Description of Participants' Interactions with Artefacts

The artefacts of interaction that influenced participants' actions and conversations in this segment were the big question, layout of the website, different types of texts in the website, two-word answer (i.e. a lemon), mouse and TV screen. This website was full of information—some useful and some unrelated—that could have prevented the group from finding the answer. For instance, the space in between the question given in the website and the answer had unrelated information. However, participants navigated through this obstacle by discarding it, locating the answer that pertained to the question, and using the mouse to scroll down the website to look for more information.

The group navigated through the text by reading silently and validating a short answer, "A lemon", showing comprehension of information by using/discarding accordingly. This answer was an artefact of interaction because it instigated the group to first acknowledge a partial answer, evaluating its usefulness, prompting them to voice the need for expanding the search. Then, the big question where all searches stemmed and returned to, was used to plan for a future question leading to answering the main question. Another artefact was the sentence, "3 people found this useful", which is generated each time a person votes in favour of an answer. This text artefact triggered a discussion in regard to the value of the information, which led the group to discover the need to rephrase the big question, which concluded in a new search. Finally, the mouse was not exclusively held by one participant but shared by all, allowing an uninterrupted interaction. The size of the TV screen allowed all participants to see and read information while discussing it.

Although listed as separate unconnected elements, these artefacts actually represent connecting features enabling self-organisation. The artefacts allowed participants to move through the information while allowing them to constantly communicate their intention and ideas.

Interpretation of analysis

The group formed networks for: analysing information, connecting information to the big question, planning for the next search, and trouble-repair. These networks were formed using a rich set of social and cognitive skills and facilitated by different artefacts (e.g. big question, mouse size of TV screen, and text). The discussion about the value of a short answer, "A lemon", allowed the group to first acknowledge that this was a valid yet partial answer, to then discover and propose how to find the rest of the answer to the question. However, in order to rephrase the question, participants formed a new network by trying different phrases, in which each subsequent phrase would correct a previous one's flaw. Finally, a participant repaired these flaws by correctly phrasing the new question to which all members agreed. The group demonstrated comprehension and learning as on each attempt they fixed the one/two-word mistakes then proposing a repair. Networks were assembled and abandoned quickly and as needed allowing comprehension emerged from these networks.

This segment is representative of Session 8: in the overall session, the participation structure centred on navigating webpages, reading the information, constructing an answer by selecting useful information, pointing out missing information and planning to find the answer. Turn-in-interactions oscillated between turns-at-talk and instrumental interactions with artefacts. Assembled and abandoned networks (i.e. self-organisation) occurred in response to encountered challenges. These networks were situated according to text features (e.g. text on a link or website content), webpage display, physical artefacts and participants' skills and strategies and participants' actions change in time as they navigated difficulties.

The style of participation of this group contributed to the *quick* formation and abandonment of networks. That is, comprehension emerged from a constant decoding, analysis, summarising of texts, and participants' ideas, but also because of the lack of a hierarchical structure within the group, which was noticed in the lack of control over the artefacts of interaction (i.e. mouse, keyboard, and text reading). This allowed a flow of

ideas and exchanges, thus leading the group to quickly adapt to each difficulty presented in the texts. In other words, in SOLE Internet comprehension emerges when its individual parts connect, flow of information is constant and hierarchical structures (e.g. hovering over mouse to control information or adult intervention) are removed. Individual participants' characteristics allow them to connect for self-organisation: social, cognitive and reading abilities. It is in the richness of these characteristics that the system connects, self-organises, and comprehends information as it was the case in session 8.

Graphic representation of session 8 event

Figure 4.1 shows a graphic representation of how the stretch of interaction in session 8 formed. It represents the nested system found within a Website Comprehension event shown in three segments of interaction (Green tiles): Website Comprehension, and two (2) Type Question instances. The source of perturbance was identified in here as the big question (i.e. brown bracket with an opening on the top to indicate the possibility of continued self-organisation).

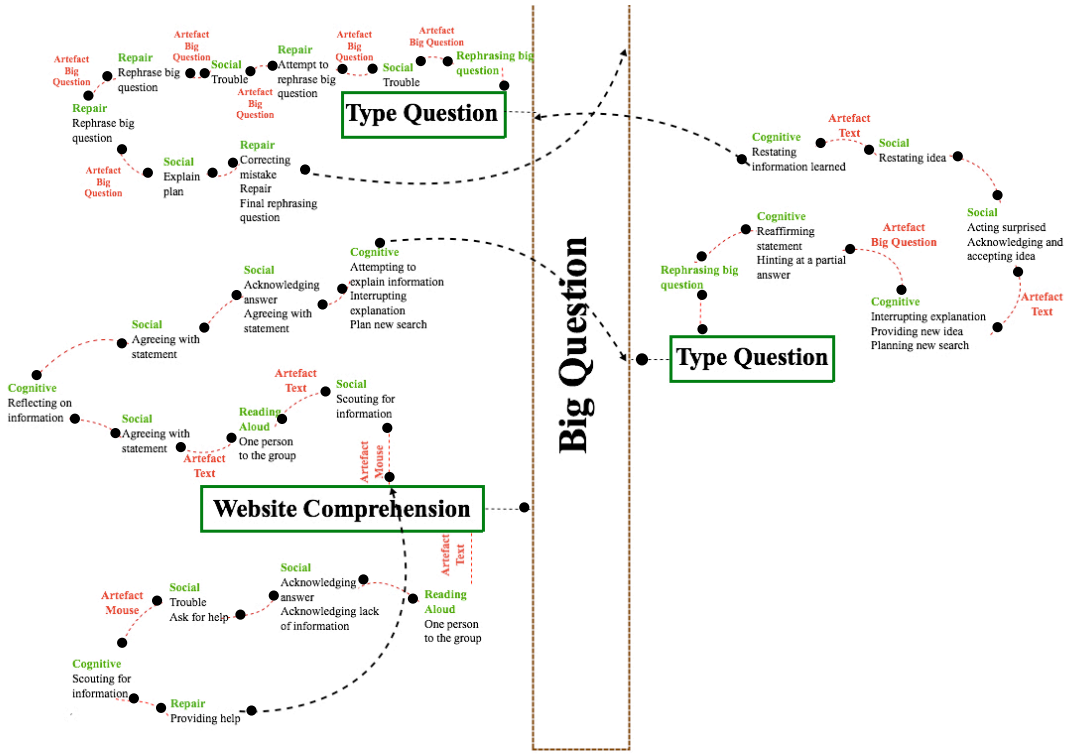


Figure 4.1 Graphic Representation of a Complex System in Session 8

Graph legend:

	Brown bracket with opening at the top	Source of perturbance
	Green rectangle	Event of Interaction
	Black straight dotted line	Segment begins
	Red straight dotted lines	First interaction in the segment
	Red curved dotted lines	Subsequent connected interactions in the segment
	Bold curved dotted lines with arrow point	Transition from segment to segment or event to event
	Black dot	Node of connection for each element of the complex system
Artefact Text	Red text	Artefact of interaction with participants
Reading aloud One person to the group	Green and black text together	General and specific skill/strategy used in the interaction

This bottom-up graph indicates progress over space and time. Therefore, the first event is Website Comprehension (Green rectangle). At its bottom and read from right to left, the group of skills/strategies and interactions with artefacts represent the first segment were participants are attempting to comprehend the information without success. Then a transition is shown by a bold curved dotted line with an arrow pointing back to Website Comprehension rectangle to indicate a transition into a new segment within the same event. This second segment shows progress in comprehending information (Read from right to left), which was ended when the group recognised they had a partial answer to the big question, transition into a new event through a bold curved dotted line: Type Question. This next event shows the idea to type a new question was generated (Read from left to right). Once they established this need, a last transition was shows participants efforts to find the right words to rephrase the original question (Read from right to left). This event ended with a click back to Google screen to type the new rephrased question.

It is important to mention that this was a highly connected network, where all information forms part of the same structure, only to be separated by the passage of time (i.e. activity to activity) and change in space (i.e. scrolling down text and conversations between participants) represented here in a "growing tree" figure. As in real-life, this tree grows branches in opposing directions and almost one branch and leaf at the time. However, limitations into the data cannot recall when branches and leaves actually grow or stop growing (i.e. self-organisation) since some of the ideas that originate the branches are untold participants' thoughts. Connectivism (Siemens, 2005) explains how knowledge and learning can happen inside individuals at the neural level, helping explain the limitations of this tree representation. What is important here is that the graph portraits how a complex system was formed around a two-word sentence, limited by the bounds of the big question, leading to the emergence of an answer (i.e. knowledge and learning).

4.2.2 SOLE Session 12

The participation structure of interaction was defined by the big question: "Why do solids conduct electricity better than liquids?" Participants had already solved the following electricity related questions:

Session 4: What is a dynamo and how does it work?
Session 5: How does a dynamo generate energy?
Session 6: How to power a lightbulb with wind?
Session 7: How can you generate electricity with potatoes?
Session 8: What conducts electricity better: a lemon or a potato?

They had been exposed to the concepts of electricity and magnetism from the SOLE sessions and teacher centred instruction in the classroom. For example, in segment 2 of this session, a participant makes the connection between a prior question to use the information to answer the current question, showing how a built history over time and space can bring connections for students to answer other big questions.

As in all sessions, the group was self-selected. However, this group had a combination of students who were friends and others with a less closer relationship. Although each participant chose to be in this group, some constant friction to grab the mouse and to agree on information was perceived. This made it difficult for students to flawlessly comprehend the information as in the group in session 8, nonetheless, it also gave the

group the advantage of proposing opposing arguments for others in the group to change or reiterate what they knew and comprehended.

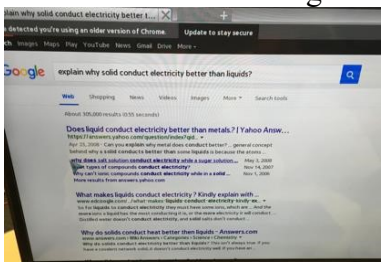
This was a mixed ability and mixed gender group, in which some students were excellent readers while others struggle to read at the fourth-grade level. There were no English learners and one student had been diagnosed with Attention Deficit Hyperactivity Disorder, then receiving therapy and special education services.

All participants were able to see the information on the TV screen but only one participant controlled the keyboard and a second one held the mouse. In a short argument, they decided to distribute the materials (i.e. mouse and keyboard), which still caused friction. Through the session, some participants wandered around the room to see what other groups were doing, then return to the group, however, failing to report what they saw.

This session was chosen because it represents a different kind of participant interaction that still led to information comprehension as well as an interaction that could have led to answer the question. However, because of the lack of group support at a crucial time, the question remained unanswered, indicating the importance of collaboration for self-organisation to occur. These were portrayed in two events chosen from session 12.

Event 1

Prior to this event, students began the session with struggles to share the mouse and support one another in typing the question. They constantly yelled or frustrated the typing of the question. Therefore, when event 1 began, some students were already upset at each other while others were trying to maintain peace and order. The structure of interaction in this event centred on participants' attention to clarify information before choosing a link. There was an argument about the words liquid, solid, metal, and heat, which affected the information that each link provided. Some participants wanted to click on links that were unrelated yet similar to the big question, while others tried to explain how this choice was wrong. The group spend some time in this argument until the mouse holder unexpectedly clicked on the link of his preference, leading to a website that did not answer the big question. Table 4.7 contains the transcription of the interactions, strategies used by participants, observations and screenshots of visited website.

Transcript	Type of Skill or Ability	Observation	Screenshot
[Mouse clicking and tapping on the table]		A participant believed he found the answer to the question as one of the links had almost all the same words as in the big question. However, a second participant said that it was not the question and the first participant insisted that he was right by reading the entire question. A third boy asked the person holding the mouse to click on that link and a girl declared that this particular link had the question and thus the answer. However, the boy holding the mouse pointed out that the question in the link referred to heat instead of electricity. The first participant insisted and stated that electricity and heat was the same thing, but the second participant clarified that it was not true. The argument ended when the researcher asked why the group chose this particular link.	This is the same Google Search page as in the previous segment. It showed links for www.answers.yahoo.com, www.edcooglee.com and www.answers.com. These three websites are for posting and answering questions, although www.edcooglee.com is geared towards teachers and students to do so. Also, Google Search offers other tools such as videos and images as a different mean of grouping information. The group did not attempt to access these searching tools at this time 
Boy 2 No. That's not it! It says [pause]. That's liquid and metals. So that one is saying, does liquid conduct it better than the solids?	Yelling for trouble-repair, provide explanation, summarising information		
Boy 1 No, it doesn't.	Rejecting explanation, trouble		
Boy 2 Yes, it does. It says, “Does liquid conduct electricity better than metals?”	Reiterating point of view, reading aloud, repair		
Boy 1 Go right here. Can you put it right here?	Accepting explanation, discarding link, reading silently, pointing out information, trouble		
Girl 2 That’s the answer. It has the answer [pause] I mean, that’s the question. It has the answer.	Reading silently, agreeing with an idea, connecting big questions and title, trouble		

Boy 1 "Why solids conduct electricity better than liquids?" It says it right here.	Reading aloud, pointing out information on TV screen, defending point of view, trouble
Boy 2 Heat. Conducts heat.	Comparing two concepts, explaining information, defending point of view, attempting to repair
[Mouse clicking and tapping on the table]	Using link
Boy 1 Heat, it's the same thing.	Comparing two concepts, rejecting explanation, explaining information, defending point of view, trouble
Boy 2 Electricity and heat. It's not the same thing.	Rejecting explanation, defending point of view, explaining information, attempting to repair
Boy 1 Ah! You just spit on my face.	Complaining

Table 4.7 Data for Session 12

Description of Participants' Interactions

Participants discussed the information presented on each link in detail: When Boy 1 pointed to a link (Pointing out information) that said, "Do liquids conduct electricity better than metals?" (Trouble), Boy 2 clarified that the link was unrelated to the question (Repair) by reading the title to the link (Reading aloud) and summarising its content using the two main words in the question: liquids and metals (Summarising information, clarifying information). Boy 1 disagreed with Boy 2's explanation (Rejecting explanation, trouble), and Boy 2 read the question again (Reiterating point of view, reading aloud, repair). Although Boy 1 did not verbally acknowledge that Boy 2 was right, he accepted the argument (Accepting explanation) by discarding the link (Discarding link) and then pointing to another link (Pointing out information on TV screen, reading silently) with a similar question, "Why do solids conduct heat better than liquids?" (Trouble). This time Jennifer agreed with Boy 1 that the link contained the big question (Agreeing with an idea, connecting big question and title, trouble), which implies that Jennifer read the title silently (Reading silently) in order to agree with Boy 1. Boy 1 read the title aloud (Reading aloud) and then pointed out where he found it (Pointing out information on TV screen), trying to emphasize that the link contained the answer to the question (Defending point of view, trouble). Boy 2 accentuated that this question referred to heat instead of electricity (Comparing two concepts, pointing out information, rejecting explanation, defending point of view, attempting to repair). While the group was talking about the appropriateness of the link, Boy 1 clicked (Using link) on the link he was trying to defend, and the argument continued. Boy 1 argued that heat and electricity were the same concepts (Comparing two concepts, rejecting explanation, defending point of view, trouble), but Boy 2 said that they were not the same (Rejecting explanation, defending point of view, explaining information, attempting to repair). The argument ended when Boy 1 told Boy 2 that he spat on his face (Complaining) and Boy 1 clicked on the last discussed link.

Description of Participants' Interactions with Artefacts

In this segment, the artefacts of interaction were TV screen, mouse, website links and wording of the links. When Boy 1 pointed with the mouse to a link, this action was visible to all participants because of the size of the TV and the mouse cursor and therefore, all participants had the opportunity to react to Boy 1's action. When the discussion about the information provided in the links took place, all participants were

able to read the information by themselves. Then, links were artefacts of interaction that triggered reading and scouting for information, thus orienting the group to finding an answer to the question.

The wording of the links was the main artefact of interaction as it posed the challenge to the group, making them discuss the relationship between the big question and the information provided on each link. At first sight, the links seemed to relate to the question as they shared almost the exact words, however, upon closer analysis, the group discovered that the link was unrelated to the big question. Finally, while the group discussed the information, the mouse holder decided to choose a link without everybody's consent, indicating a use of a link and dismissal of the others' views.

Interpretation

A network was activated for understanding links in detail: a discussion about the similarity of two words compared to the words in the question. This sequence of events—reading the text aloud, an explanation and an acceptance/rejection of explanation—allowed the group to closely examine content of the links while forming arguments to discard unrelated links. This attempt to comprehend this information failed in this segment because some members of the group misunderstood the information while the right explanation was ignored. The one participant who understood the information correctly did not have a chance to stop the mouse holder from choosing the incorrect link, therefore, he had to wait for the chosen website to load up and explain the information, as it can be seen in a later segment. In that later segment, all participants agreed that the accessed answer was unrelated to the big question, which resulting in discarding the website.

This interaction was rich in interaction as participants reviewed the links in depth. It was evident that participants used a variety of social and cognitive strategies to navigate the subtleties of the information such as switching two words within a sentence (i.e. liquid and metals) and the assumption that a word can be replaced by a similar word (i.e. metals and solids, electricity and heat). This network formed to serve an information comprehension purpose.

Graphic representation of session 12 event 1

Graph 4.2 is read from the bottom to the top of the brown rectangle to indicate progress over time, while branches can be read either from right to left (Link Comprehension 1 and Choose Link) or left to right (Link Comprehension2). The first event is Link 1 Comprehension (Green rectangle): at its bottom the group of skills/strategies and artefacts represent the first segment were participants are attempting to choose a link for which they elaborated different understandings. Once all participants agreed that the link was not useful, a bold curved dotted line with an arrow pointing to Link 2 Comprehension rectangle indicates a transition into comprehending a second link. This second segment is an argument to comprehend the information. This segment ended when a participant clicked on a link of his own choice even though another participant understood why the link had unrelated information to the big question. This transition is indicated by a bold curved dotter line with the arrow pointing at Choose Link. This new event unfolded in an argument about the words “Heat” and “Electricity” that occurred while the website was loading up.

This graph shows a network highly connected by the arguments between the participants about the information in the links. As in session 8, some internal (i.e. neural) connections and networks (Siemens, 2005) are not possible to represent in here. For instance, in Link Comprehension 1 when the student understood why the link was unrelated to the big question and changed his mind, is an internal connection that cannot be represented here. As in session 8, this graph shows the process by which participants self-organised motivated by the friction maintained among participants and sustained by the big question. The emergent phenomenon was comprehension in the instance when all students understand why the first link does not relate to the big question. The error made in choosing the second link is later on corrected, showing another element of a complex system: self-correction (Morrison, 2006).

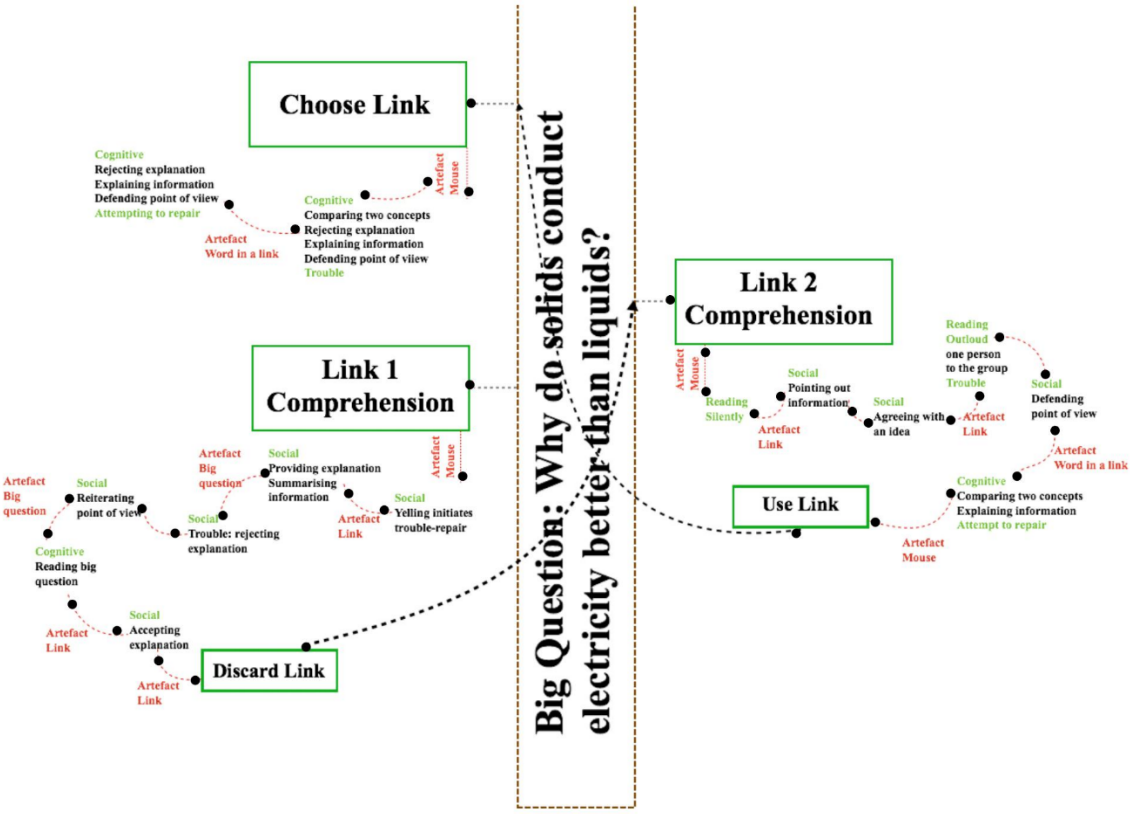


Figure 4.2 Graphic Representation of a Complex System in Session 12 Event 1

Event 2

The focus of this structure of interaction was to evaluate information on a webpage. Boy 2 has read the information to himself and then tried to explain it by connecting it to a prior big question, first to the researcher and then to Boy 3. Other participants were distracted, and the network was formed by two students only. Table 4.8 contains the transcription of the segment, skills and abilities participants used to comprehend, observations and screenshots of the interaction.

Transcript	Type of Skill or Ability	Observation	Screenshot
[Laughing]		After reading parts of the article, Boy 2 made a connection between a prior question and today's question. He realised that in a past SOLE session, they learned that the liquid in juice conduct more electricity than the solid on a potato. They tried to read more of the article but it wasn't fully loaded.	This webpage provides an answer to the question, "Why do solids conduct electricity better than metals?" The answer is written on the top of the page, "This isn't always true. If you have a covalent network solid, it doesn't conduct electricity well. If you have an electrolyte-rich liquid, it conducts electricity VERY well. However, generally, metallic solids conduct electricity because the electrons can move freely between them. In many liquids (like distilled water) there are no ions for the electrons to transfer through." The rest of the website has the same components as in the previous segments.
[Mouse scrolling up and down the webpage]	Reading silently		
Boy 2 I have an answer, sort of. I have an answer, sort of.	Pointing out information, acknowledging answer		
Woman What is it?	Asking for answer		
Boy 2 Um.	Pausing		
Woman Talk to your team. Talk to your team.	Redirecting		
Boy 2 Well. It's usually. It's usually. It says on the thing, is not or it's true, because some, some liquids are electro rich so they can, so they can generate... Like, remember the potato, the potato thing with the juice?	Synthesising information, clarifying an action, connecting information with prior big question, saying keywords to elicit past memory		
Boy 3 Yeah!	Recalling prior big question, assenting memory of prior big question		

Boy 2 The potato thing. How the...? [Pause] It's because the juice generates the electricity and [interrupted].	Memory recall, explaining a past answer	
Boy 1 And the electricity [interrupted].	Interrupting explanation, piggybacking an explanation	

Table 4.8 Data for Session 12 Segment 2

Description of Participants' Interactions

A network was formed here to make a connection between webpage's text, a prior big question, its answer and the current question. Participants had typed the question on www.answers.com's browser and only one answer appeared on screen. The observation log indicates that the webpage was only partially loaded and for this reason a participant was scrolling up and down the page while others in the group chatted. Some participants were socializing while others were reading information (Reading silently).

After a while, Boy 2 announced to the researcher that he believed he had found an answer (Pointing out information, acknowledging an answer). The researcher asked for answer (Asking for answer) and when Boy 2 paused for a moment (Pausing) the researcher quickly redirected him to talk to his group (Redirecting). Boy 2 synthesised part of the text to Boy 3 by saying it in his own words (Synthesising information) but paused to clarify that what he was saying was on the text (Clarifying an action). Boy 2 stopped without completing the synthesis of the text to ask Boy 3 if he remembered a big question they solved in a prior SOLE session (i.e. "What conducts electricity better a lemon or a potato?") (Connecting information with prior big question). Boy 3 responded, "Yeah!" in excited agreement (Recalling prior big question, assenting memory of prior big question). Boy 2 said, "Potato" (Memory recall) to ensure that Boy 3 remembered the question and added that the electricity of the lemon and potato resided in the juices (Explaining a past answer). Boy 3 spoke over Boy 2 to continue the explanation (Interrupting explanation, piggybacking an explanation), but he was interrupted, and the explanation ended here.

Description of Participants' Interactions with Artefacts

In this segment, the artefacts of interaction influencing reading comprehension were the mouse, partially loaded website, text, and a prior big question. Boy 2 controlled the mouse and used it to scroll down the page hoping the website would fully load up. He controlled what other participants were able to see. The website, www.answers.com, only provided one answer to this question, limiting the range of information. However, this also allowed Boy 2 to pause and make connections between the information presented on the website and a prior big question by prompting his prior knowledge.

The question “What conducts electricity better a lemon or a potato?” is another important artefact of interaction from a prior session. It prompted the group to elicit prior knowledge learned in SOLE to construct an answer to the present question. This was also present in other audio-recordings, when one participant elicited a prior big question and its answer, others in the group benefited from this interaction by making broader connections and generalisations for a better understanding of the topic at hand (e.g. electricity). It should also be noted that the answer to the question came from www.wikianswers.com, which is a webpage dedicated to asking and answering questions with the possibility of editing the information. This page is open to the public and maintained by volunteers. Therefore, the answer to this question and others are generated by large groups of people, which in turn regulate how content is presented.

Interpretation

Since some of the individuals in the group were distracted from reading the information, a network was quickly formed and abandoned. One participant read the text and communicated his idea first to researcher and then to an individual in the group. A half-spoken answer was quickly received and accepted by the participant through a reference to a prior question. Once this connection was made, the second participant attempted to provide his own explanation, but he was interrupted. This was a much simpler and weaker network because only two participants interacted and were interrupted. Although the idea would have led to answering the question, the lack of interactions and participants’ perseverance had the group abandoning this idea.

Graphic representation of session 12 event 2

Figure 4.3 shows a graphic representation of the self-organising system that emerged in this interaction. As in other graphs, Website Comprehension (Green rectangle) represents a segment of an event when a student attempts to explain the information to the researcher, who quickly addressed the participant to a group mate. Then, second Website Comprehension (Green rectangle) represents the moment when the two participants attempt to comprehend the information by an exchange of interactions. Once again, this occurred over time and different spaces, which advanced the search for an answer. However, the importance of this segment in founding the answer to the big question, this is a short-live self-organisation instance where comprehension was beginning to emerge but quickly abandoned by the lack of further interactions.

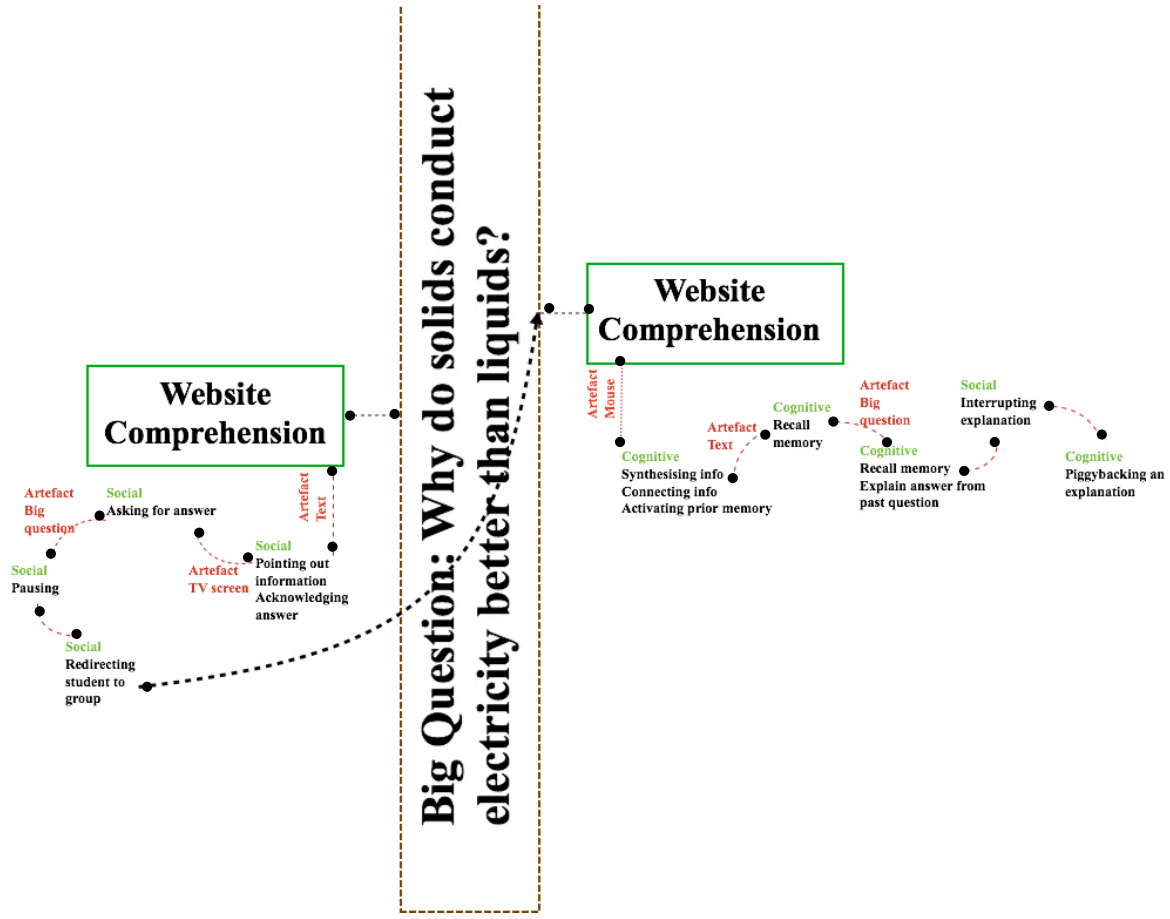


Figure 4.3 Graphic Representation of a Complex System in Session 12 Event 2

Overall, session 12 showed how individuals interacted with members of the group and artefacts available during the session in order to self-organise for reading comprehension and answering the big question. Several networks of interactions were formed according to the situated needs of the group: scouting for information, analysing information, evaluating information, decoding text, clarifying a mistake, connect information from prior and present SOLE sessions, and explaining lack of information. This was possible by the many turns-in-interaction between individual/group's skills and abilities (i.e. reading mode, decoding skills and strategies, collaborative skills and strategies and cognitive skills and strategies) and material artefacts present during session (i.e. size of TV screen, computer mouse, bench, SOLE rules, big question, links, website layout, website texts, etc.). Although in most segments the emergent phenomenon was comprehension, the overall outcome of this session was not completely favourable towards answering the question. It is evident that some of the comprehension occurred by an explanation from the same participant. However, success of this turn-in-interaction on comprehending information also relied on how

other individuals in the group reacted to his explanations. In some cases, a quick verbal or non-verbal agreement was sufficient, while in other cases participants responded with more comprehensive explanations. Overall, the emergent phenomenon of this self-organising system was Internet comprehension and an approximation to answering the big question.

There was one segment in which a weak network was formed due to the lack of interaction between participants: some participants were engaged in chatting and thus only one person read and explained the information to another participant. Despite efforts, the explanation did not result in an answer to the question, which points to the importance of explanations paired with expressions of acceptance, rejection, asking questions for clarification and support from others in order for comprehension and an answer to emerge.

Finally, in some segments there was a struggle to control artefacts such as the mouse and choice of links. At times, the group made some of the choices while at other times the mouse holder decided for the group. Some of the individual choices led to wrongful websites, which resulted in wasted time. In session 8, the lack of control by individuals allowed the group to quickly form and dismantle more efficient networks, which was not the case in Session 12.

4.2.3 SOLE Session 14: A deviant case

This session is considered a deviant case (Schegloff, 1968) because of the 11 audio-recordings, this was the only one in which the control exerted over information and artefacts by one participant prevented the group from effectively comprehending texts and finding an answer to the big question. Participation structure of interaction was defined by the big question: “Using alternative energy, how can we light up our Christmas tree?” At the time of this session, students had already answered the following electricity-related questions:

Session 4: What is a dynamo and how does it work?
Session 5: How does a dynamo generate energy?
Session 6: How to power a lightbulb with wind?
Session 7: How can you generate electricity with potatoes?
Session 8: What conducts electricity better: a lemon or a potato?

Session 12: Why do solids conduct electricity better than liquids?

Session 13: Why don't all fish die when lightning strikes the sea? Explain

Therefore, students were already acclimated with the concept of electricity as well as performing searches, typing the question and other activities common to SOLE sessions. Spatial organization (i.e. SOLE laboratory), SOLE rules, and allocated time to answer the big question remained the same as in all other sessions.

The group had only two participants for most of the session, a boy and a girl. Participants sat together on one bench and both were able to see the information on the screen. One participant took control over the keyboard and mouse and read for the entire session while the other participant did not oppose to it. It was noted that when information was being loaded in the screen, the boy was asking the girl personal questions about celebrations and holidays. He invited her to a playdate and they had a conversation about different things they do at home. Despite the focus on personal information, there were several attempts to find answers to the question, however, highly controlled by the girl.

The participation structure in this segment focused on scouting through links to find a suitable website answering the big question. A participant looked and discarded websites until she found one she liked. However, when a second participant disagreed with her choice, she quickly clicked on a link of her preference.

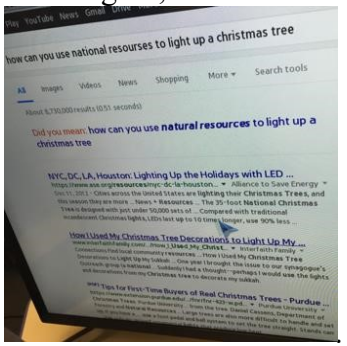
Transcript	Type of Skill or Ability	Observation	Screenshot
[Mouse click]		Ann continued doing a couple more searches but could not find an answer that satisfied her.	This is a Google Search screen showing results for the question, "How can you use natural resources to light up a Christmas tree?" The first link is a news article reporting the switch from traditional to LED lights in Christmas trees. The second link is a personal narrative. The third is a PDF document with advice for buying the first Christmas tree. The last is a link to a website with information for visitors to the lighting of the Christmas tree ceremony in Washington, DC 
Ann: I'm going to have popcorn for movie night. [Mouse scrolling] I think I found it.	Chatting, pointing out a link		
Boy 2 Oh really?	Acting surprised, acknowledging comment		
[Making noises]			
Ann: No! [Mouse scrolling] No! [Mouse scrolling] No! [Mouse scrolling]	Reading silently, discarding links		
[Making noises]			
Ann: Yes!	Acknowledging finding a link		
Boy 2 I, I was pointing to that.	Pointing out a link		
[Mouse click]	Using link, ignoring comment		
Boy 2 No! No, but that's a ceremony.	Making a request, explaining information, making an inference from text		

Table 4.9 Data for Session 14

Description of Participants' Interactions

The segment began after Ann typed the rephrased question and clicked the Enter key. She was chatting with James when she announced she found a helpful link (Chatting, pointing out a link), to which James replied, "Oh really?" (Acting surprised, acknowledging comment). Ann did not respond to James'' comment, but silently read (Reading silently) information in links, which can be inferred by Ann repeatedly saying, "No!" followed by sound of a mouse scrolling down the page (Discarding links). She discarded three links until she said, "Yes!" (Acknowledging finding a link), but James told her he was pointing to a different link (Pointing out information a link), and Ann quickly clicked on a different link than the one James was pointing to (Ignoring comment). James told Ann that the link she had chosen referred to a ceremony (Making a request, explaining information), inferring that information was unrelated to the big question (Making an inference from text).

Description of Participants' Interactions with Artefacts

The group was confronted with three artefacts of interaction: size of TV screen, mouse, and Google Search links. Size of TV screen allowed both participants to read links and also to track each other's' actions. For instance, when Ann placed mouse on a link, she did not have to say which link she was pointing out since James could see the cursor resting on it. This saved time and allowed group to focus on the content of the links. The mouse also played an important role: Ann had full control of mouse and ignored James' choice and comment by just clicking on a link of her choice. Finally, links regulated the participants' actions: the group manoeuvred around texts based on the big question.

Interpretation

It is evident that Ann and James were both trying to find the answer to the question. However, Ann was doing this search independent of James, that is, she imposed her choices and James did not stop Ann's actions. As a result, group did not form networks that might have led to better text comprehension and ultimately to a better choice of link.

As in other sessions, participation structure was centred on answering the big question, and thus navigating webpages and reading different texts. This session was mainly

characterised by the lack of participants' turn-in-interaction. It began with three participants and soon thereafter one left. Of the two remaining, one participant maintained full control over reading, mouse, and keyboard for the entire session while the second participant mostly watched the other making all the choices and rarely intervening to provide his own opinion. Comprehension networks in SOLE are highly dependent on connections forming in interaction. However, when control is exerted over information and/or materials, groups do not form networks and comprehension becomes problematic and limited to the person controlling the interaction, as in session 14. Since one of the participants refused to consider the ideas presented by the other, a graph representing the interaction is unnecessary: Self-organisation did not occur here.

4.3 Summary of findings

In this chapter, the analysis of data and its findings were presented. Findings for phase 1 showed that fourth-graders in New York City could read complex texts for their academic ability when they read in groups as opposed to individually. Then, when text complexity was manipulated for group reading activities, results showed that fourth graders consistently read better fourth as opposed to eighth grade texts, indicating that there was not statistical significant difference favouring either condition. As for findings in phase 2, it was indicated that participants used networks of interactions to solve reading and other challenges. When an individual from a group control the artefacts of interactions, the lack of collaboration prevented the group from forming networks thus comprehending texts to solve the big question in SOLE situations.

Chapter 5. Discussion

5.1 Introduction

The line of enquiry of this study began with a quantitative approach to reading offline texts and evolved to understanding Internet comprehension. This study questioned and expanded preconceived notions of students' abilities to read texts in groups, a need for traditional scaffolds, and ultimately aimed to find a modern approach to enhance students' reading abilities that is better aligned with America's 21st century expectations. This multiphase research design comprised of two phases and a pilot. Phase 1 determined occurrence of a phenomenon, the pilot tested activities for an intervention, and phase 2 explained how students comprehended Internet information in SOLE. For this, situations were presented to fourth-graders in New York City to read individually and in groups, offline texts and Internet information, and answer questions.

This discussion is structured through a review of the methodology that answered the following research questions: 1) Is there a statistically significant difference in comprehension scores of New York City fourth-graders when reading in groups eighth-grade texts with Internet as a search tool as opposed to reading individually without Internet access? 2) Is there a statistically significant difference in comprehension scores of New York City fourth-graders when reading fourth versus eighth-grade texts in collaborative groups with Internet as a search tool? 3) What do fourth-graders of New York City do to comprehend Internet information when asked to solve a big question during SOLE sessions?
Then a discussion of the findings is presented regarding prior research and then contributions of this investigation to the research of group work and Internet comprehension. Limitations are outlined, and theoretical and practical implications are discussed. This chapter ends with recommendations for future research and a summary.

5.2 Phase 1 discussion

In order to challenge the most common practices for teaching reading in America (i.e. teacher instruction and text control measures), a literature review was undertaken. The review showed that these practices began as a necessity to instruct students of different ages and abilities in Common Schools (Smith, 1986) and was established by coordinated efforts of publishing companies and scholars (Shannon, 1989). Years after

this practice was established, studies began on reading comprehension skills and abilities (Pearson, 2009), evolving to the benefits of reading in groups (Murphy *et al.*, 2009) and finally to Internet comprehension (Leu *et al.*, 2017).

A literature review on group work was undertaken and it revealed that it has been approached from Behaviourism, Constructivism, Social Development, and collaboration in computer mediated situations (Dillenbourg *et al.*, 1996; Blatchford *et al.*, 2003; De Laat and Lally, 2003; Siemens, 2005). Influenced by behaviourist views, the first investigations measured the effects of group work on student individual skills such as problem solving (Rojas-Drummond and Mercer, 2003), planning and execution of ideas and building with accuracy (Azmitia, 1988). Then, based on Vygotsky's (1978) theory of social interaction for knowledge gain, research concentrated on the dynamics and mechanisms of social activity enabling or discouraging learning in relation to compatibility of group work (Webb, 1989), cognitive and collaborative skills (Gauvain and Rogoff, 1989), students' verbal interactions (Teasley, 1995; Baker, 1999; Wegerif *et al.*, 1999; Rojas-Drummond and Mercer, 2003), and influence of teacher on group interactions (Cohen, 1994). Finally, introduction of technology in the classroom created the need for a new focus of study: collaborative knowledge building, group and individual perspectives, and mediation by artefacts (Stahl, 2002).

In phase 1 of this study, it was important to understand the impact of group work on the ability to read at higher grade levels and a literature review was conducted for the same. Several studies supported the benefits of peer collaboration for reading enterprises. For instance, Palinscar and Brown (1984) developed a reading program that improved test scores and generalised reading strategies to novel tasks. Similarly, Rojas-Drummond et al. (1998) tested the impact of peer collaboration on individual reading skills using Palinscar and Brown's (1984) approach with additional socio-instructional support: an adult provided social scaffolds for students to collaborate effectively. Results showed improvement in strategies for processing narrative and expository texts.

A common denominator of these studies is the use of scaffolds: teacher intervention, peer-tutors and text complexity levels matching readers' abilities. Stevens et al. (1991) found that when students were provided with direct teaching on reading strategies and then given the opportunity to practice these strategies in collaborative groups, students scored higher in reading comprehension tests than when direct instruction was removed. Similarly, Morgan et al. (2000) showed that while reading in dyads, poor readers

benefited from practice with a more capable peer when text control measures were taken into consideration. When texts were two grade levels above readers' abilities, reading scores in standardised tests improved more than when texts were higher than two grade reading levels or at grade level.

Research without these scaffolds was only found in Mitra and Quiroga's (2012) preliminary study in which young students read complex texts in groups with Internet access, however, authors reported limitations in the small sample size. Then, an identified research gap created the need to investigate if young students could read texts that were complex and advanced for individual reading abilities.

The rejection of null hypothesis 1 does not support most of the aforementioned research. This indicates that fourth-graders can read complex text in groups with the Internet as a research tool and without adult support, but they cannot do the same individually. Retention of null hypothesis 2 supports and expands the evidence found in the same literature review: when in groups and without adult support, fourth-graders can solve a variety of levelled texts (e.g. fourth and eighth-grade texts) using the Internet as a research tool. Rejection of null hypothesis 1 and retention of null hypothesis 2 provide a step forward into the transition from group reading of offline text to information comprehension in Internet environments of group mediated activities, discussed in more depth in phase 2.

The results in phase 1 bring into question different aspects of group work for reading in the areas of: use of traditional scaffolds to achieve reading comprehension, introduction of the Internet as a research tool and group collaboration. Most common scaffolds found in the literature were text complexity, teacher intervention and peers as tutors. First, text complexity, a central tool to the Common Core Standards of education in the United States (EngageNY.org, 2012), did not show statistical significant differences between reading fourth and eighth-grade texts when students read in groups but statistical difference was found when reading eighth grade texts in groups as opposed to individually. This indicates that controlling for complexity when reading in groups is unnecessary, yet it still affects individual reading. If we apply this results to the reading environments found on the Internet, first, we can comfortably say that the Internet does not control for complexity according to the user – young students in this case- and therefore, students can be more successful at researching in the Internet when in groups as opposed to individually. Second, these findings bring into question text complexity

as an essential component of reading instruction and puts forward the need to broaden the spectrum of how reading is understood, that is, from the construction of text to a much larger activity called Internet search and comprehension. In this case, areas such as group work, integration of information from different resources and evaluation of information trustworthiness -to name a few- gain a central status in academic instruction, which cannot longer be called reading instruction as it goes beyond the act of reading. Third, text complexity limits how students are understood in terms of abilities -able/unable to read at an expected level- and therefore instruction is centred around this one feature. Expansion of reading beyond complexity levels changes how readers and reading are envisioned in the classroom: for example, a socially mediated activity that emerges in interaction with objects and people.

Teacher instruction in how to effectively collaborate and converse in group reading situations was purposely avoided in this study: the researcher only provided encouragement and safety where needed, which led students to use what they knew about reading and collaboration to solve texts. It could be implied that since students were acquainted with each other and were observed successfully interacting in other settings, then they just had to apply these socialization skills to solve the given texts. Additionally, all students of the study had received reading instruction for at least four years of schooling and therefore, as a group they had sufficient knowledge of reading to solve comprehension questions given at the end of each text. This indicates that students in fourth-grade are prepared to collaborate in reading activities for successful comprehension of texts, but, it cannot be said that teachers did not play an important role in this study since they taught students how to read, which enabled the necessary knowledge to complete activities successfully.

Another common scaffold in group work for reading is peers as tutors, which was avoided in this study. All students were given the same directions and differentiated treatment was avoided to ensure students perceived each other as equal collaborators. This brings attention to a shift in how students are perceived, that is, from a view of capable/less capable students and from developed skill/lack of skills to what each student can bring to a collaboration to ensure text comprehension. Then, it can be implied that each member of the group brought to the interaction a diversity of skills -beyond reading- that made comprehension possible, which is evident and discussed in phase 2.

These common scaffolds (i.e. text complexity, teacher instruction and peers as tutors) were embraced at a time when the Internet was not a tool in the classroom. Presently, in Internet enabled settings, these scaffolds become unnecessary as students' natural attitudes towards collaboration and all the tools found in the Internet allows comprehension to occur. Tools such as hyperlinks, videos, and images seemed to support comprehension of fourth and eighth-grade texts when students read in collaborative groups. This brings new possibilities for students and teachers: a new and expanded definition of reading, new approaches to reading individually and in groups, and most importantly the inevitable shift from offline reading to Internet search and comprehension.

As for group work, it seems contra intuitive that neither condition (i.e. reading fourth and eighth-grade texts in groups) was favoured. Since one text was easier to read than the other, it would be expected that students would score best in the easier text, and yet, in individual reading of eighth-grade texts, comprehension hardly emerged. This indicates that student collaboration was the driving force enabling comprehension more than individual reading ability. Groups provided the individual a better environment to comprehend text of diverse levels, which is more evident in phase 2 of the study.

Overall, research conditions (i.e. reading fourth and eighth-grade texts, individually and in groups) show that when reading in groups, participants do not require adult intervention, control of text complexity and peers as tutors. That is, traditional scaffolds were not used as supports, but participants' as collaborators enabled text comprehension. This absence of traditional scaffolds contributes to the body of knowledge related to reading in peer-mediated activities. It challenges the notion that young readers always require instruction in collaborative skills or additional reading strategies to successfully carry out collaborative reading enterprises for comprehension. These results point to the idea that the Internet -as used here- is a scaffold supporting the solution of these complex texts, suggesting that participants' comprehension was enhanced by the used combination of group work and the Internet, in the absence of instruction, control of text complexity and peer support. This evidence supports the few research studies related to group reading of complex texts with young students while suggesting a transition from offline reading to Internet search and comprehension, more evident in phase 2 of this study.

5.3 Phase 2 discussion

After completing phase 1, a pilot study was conducted to test activities proposed in phase 2. Participants' responses to reading activities were tested: reading two eighth-grade texts with Internet access and questions to solve in groups, three times per week for five consecutive weeks. After a few sessions, the intervention group displayed disruptive and non-compliant behaviours. Participants stated lack of purpose and need to complete these activities. In response, a new design was proposed for phase 2. Using the Self-Organised Learning Environment (SOLE), as posited by Mitra et al. (2010), a design was implemented to explore what fourth-graders in New York City do to comprehend Internet information when asked to solve a big question in SOLE situations. The results for question 3 indicate that groups self-organise to confront Internet information and the emergent phenomenon is comprehension.

In order to discuss findings for question 3, the complex system described in this study is first characterised, the system is graphed and then the emergence of comprehension explained. For this, Complexity Theory (Davis and Sumara, 2006) and Connectivism (Siemens, 2005) are used as frameworks of explanation. Also, a self-designed graph of the complex system for information comprehension presented in chapter 3 is used to support this discussion and advance the understanding of SOLE.

Davis and Sumara (2006) described a complex system as one that presents these characteristics: it is self-organised, bottom-up emergent, containing short-range relationships, a nested structure, ambiguously bounded, organizationally closed, structure determined, and far from equilibrium. These characteristics are found in the data indicating that participants and artefacts form a complex system when trying to answer the big question in SOLE.

Self-organisation is the ability of a system to self-evolve when challenged if its parts are engaged or connected (Davis and Sumara, 2006; Morrison, 2008). In the complex system of information comprehension, networks within the structure are constantly assembled and abandoned in response to a challenge—usually a text—hence the ever-evolving nature of the system. For instance, in session 8 discussed in Chapter 4, a group of students formed and dismantled several networks to understand the implications of the words "A lemon". These networks were formed by participants discussions, through the artefacts (e.g. mouse and text) in the phase of a challenge (i.e. positioning the words

"A Lemon" under the limits given by the big question). First, the network allowed students to identified that these two words were a partial answer to the big question, once this was understood, students scrolled up and down the website to ensure the rest of the answer was not in the page, and finally they formed a second network to pose a new question that would lead to finding more information to answer the big question. In other words, students self-organised for comprehension and a new question emerged.

In SOLE, Networks are possible because of the short-range relationship between participants and artefacts (Davis and Sumara, 2006) and the nodes formed in interaction (Siemens, 2005). For instance, the size of the TV screen allows all participants to see and access the same information at the same time and to follow what others are reading or pointing out on the screen. This enables everyone in the group to state ideas, make decisions and comprehend information in the same space and at the same time. Nodes, on the other hand, determine the strength of the network: when students perceive information irrelevant, a weak node and a quick network is formed and dismantled as soon as the irrelevancy of the information is acknowledged by the students. However, in cases where students perceive the information relevant to answering the big question, a strong node is formed between participants, the information and different artefacts (e.g. TV and mouse), where students perseverate until deciding if the information is useful, partially useful or not useful at all. In SOLE, these short-range relationships are time and space bound: the short space in between participants and the information allows a time-synchrony of ideas, discussions, arguments and finally to decisions and comprehension of the information.

Another characteristic of complex systems is the bottom-up emergence or lack of hierarchy within the system (Davis and Sumara, 2006). The removal of certain traditional scaffolds (i.e. adult and peer guidance) discourages a hierarchical system from forming where one participant has power over others, unless a participant takes over the interaction by his/her own will. In SOLE, adults only interact with students if they are approached or if there is a technical/safety issue to be solved; students are told to carry the research activities independent of the adult. Therefore, they decide on the roles of each participant either by argument, compromising, proximity to keyboard/mouse, or by desire to read, in addition to solve the difficulties found in the Internet. In the most effective collaborating teams, students do not have discussions around these roles but someone in the team will assume a role which will prompt

another student to take on a different one. Therefore, hierarchy only appears in those groups focus on the roles rather than the big question. Nonetheless, it was observed that groups that failed to collaborate, quickly learned that this impeded them from finding an answer. It was the case of the girl in session 14 mentioned in Chapter 4 who asked the researcher during the presentation of the findings why her group was the only one that failed to find the answer. She then realised that the lack of collaboration had impeded her to do so.

This lack of hierarchy, although necessary for self-organisation to emerge, still needs a way to bring students from a chaotic state to some order for the advancement of the Internet search. In SOLE, rules provide this needed condition where cohesiveness and flexibility allow the system to self-organise. For instance, rule 4 states that students must present their findings at the end of the session, which is the case of the girl who questioned why her group was unable to find the answer, hence unable to present an answer. In subsequent sessions, she was observed collaborating by sharing the mouse, keyboard and allowing others to read. In other words, rule 4 entices individuals and groups to complete the activity, while the big question -source of perturbance- keeps on giving a focus for doing so.

SOLE is also ambiguously bound (Davis and Sumara, 2006). The big question in SOLE limits the range of accessed information, how students navigate information, make choices, and how information is written once an answer has been found. Yet, accessed information is of the participants' choice as opposed to adult selected -as in phase 1 and the pilot study-, opening the boundaries of text access, but again, bounded by the nature of the question. Then, SOLE rules contribute to this ambiguity in the limits and openness of the system: rule 3 (i.e. you can see what other groups are doing and report back to your group) opens boundaries that allow participants to transport information from one group to another, causing a decentralised and full network of collaboration to form; rule 4 (i.e. share your findings) limits time spent in searching for an answer and the information selected to answer the question. Free choice of information and SOLE rules foster the creation of decentralised, open and better-connected networks where the bounds are ambiguous.

SOLE is also organizationally closed (Davis and Sumara, 2006), that is, the system is not in complete chaos but follows patterns for its own evolution. Students in SOLE

display certain behaviours of interaction that emerge in response to challenges (i.e. the big question, links, website information, images, videos, etc.). These behaviours were found to be consistent over 10 out of the 11 recordings except for the deviant case presented in chapter 4. However similar, behaviours were unique to the circumstance in which they emerged. For instance, sometimes a person in a group started reading aloud then someone else joined to read in unison. In other cases, a student read aloud while others looked at the screen and silently followed reading. Finally, sometimes all group members read quietly. Here, the common pattern of interaction is decoding but in different ways and these observed patterns allow the participants to join in an activity like reading that is usually and systematically done in a solitary manner; students constantly find a way to overcome perceived challenges as this one.

A complex system like SOLE is also structurally determined: it adapts to the challenge at hand and it learns in this process. Due to the fluctuation of these networks, participants use what is learned in the formation of a network and through independent reading to react to subsequent challenges. In other words, "...complex systems embody their histories -they learn..." (Davis and Sumara, 2006, p. 6), and what is read and used/discarded forces the system to adapt. For example, participants do not use the same text once discarded, they adapt by rephrasing the question, ignoring links already used/read and planning according to obtained information. In other instances, in the face of an unknown word, participants use dictionaries and pictures to ensure they have a completed answer to the big question. In SOLE students constantly adapt.

Finally, this comprehension system is far from equilibrium: networks live and die as needed so the system is in permanent flux. Participants constantly assemble networks in reaction to a destabilizing agent (e.g. forming a network for scouting information when a new set of links appeared on the screen after typing the question) and abandon them after adapting to the challenge. Then, an apparently-reached equilibrium quickly disappears when they encounter a new challenge and the system is once again destabilised. As explained by Morrison (2008), systems thrive at the edge of chaos, where the parts of the system hold strong connections, yet control is absent. In this edge of chaos, where students displayed rich numbers of behaviours (e.g. Reading in unison, arguing about the meaning of a word, pointing out information, proposing a new question or an idea for a search) is where self-organisation as opposed to equilibrium

was reached. Then, in this self-organisation around the big question and the difficulties imposed by the internet is where comprehension rises.

In order to depict a SOLE as a complex system that self-organises in the phase of challenge, a tree analogy was used in chapter 3 to include all the aforementioned characteristics of the system. However, this graph has the limitations capturing the richness of student interaction and others that might have formed as a result of one event. For example, Figure 5.1 only captures an event of interaction, that is, it does not present other nested systems or self-organisation processes that might have occurred before or after this particular event. Nonetheless, the graph shows a self-organising system for one event.

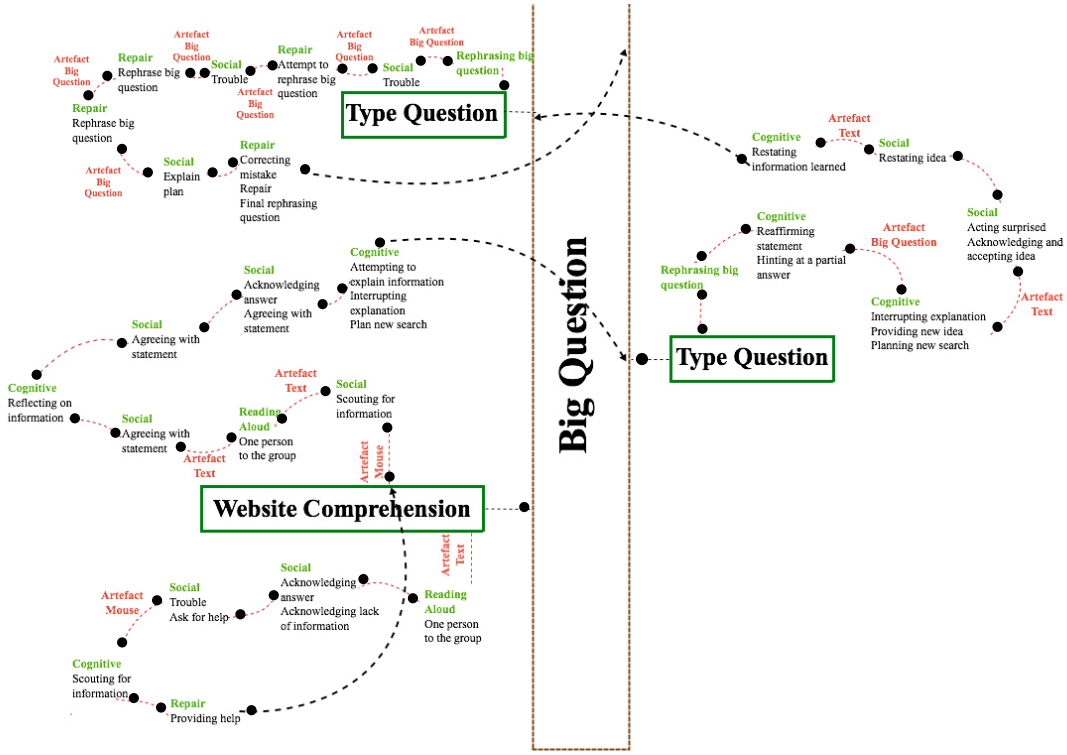


Figure 5.1 Graphic Representation of a Complex System in Session 8

Read from the bottom up to indicate the emergence of behaviours and interactions according to the challenges, Figure 5.1 shows how students in session 8 self-organised to comprehend information, identify a partial answer to the big question, and rephrase the big question to find the remaining answer. The graph shows how just one event alone creates such a complex but somewhat patterned system, where students create

order based on the big question (i.e. source of perturbance), where otherwise would be chaos.

Finally, it is important to mention that in this tree analogy there were two elements that were purposefully omitted: the "roots" and trees next to each other where not graphed since the limits to the analysis where placed according to research question. However, graphing the roots would indicate the histories of the students such as prior computer literacy knowledge, reading knowledge, ability to collaborate, Internet information, connectivity, mouse and keyboard capacity, size of the TV screen, that allow the groups to self-organise. In other words, it would include internal and external processes related to knowledge and learning that enable self-organisation (Downes, 2012).

Graph legend:

	Brown bracket with opening at the top	Source of perturbance: Big question
	Green rectangles and words	Event of Interaction
	Blue rectangles and words	Element of transition of events
Artefact	Red word: Artefact	Artefacts used to transition between events/segments
----------	Black straight dotted line	Event begins
	Black curved dotted lines	Connected events containing artefacts
	Bold curved dotted lines with arrow point	Transition from event to event
	Black dot	Node of connection for each element of the complex system

As to answer, "What do fourth-graders of New York City do to comprehend Internet information when asked to solve a big question during SOLE sessions?" we can start by saying that this characterised complex system called SOLE enables:

- Network of knowledge formation between students and artefacts

- Network navigation on the Internet
- And ultimately, emergence of comprehension

Data shows that when participants interact with other participants and SOLE artefacts, they assemble and abandon networks for comprehending information, thus forming a complex system. Structures of interaction form around the Internet (i.e. to answer the big question and comprehend information), elements influencing turns at talk (i.e. cognitive skills, social skills, reading mode and decoding skills) and instrumental interactions with artefacts (i.e. size of TV screen, mouse, keyboard, SOLE rules, big question and the Internet). For this reason, when there is strong nodes (Downes, 2012) and constant connectivity between participants and artefacts, networks quickly form to overcome a difficulty and/or random factor, hence participants' ability to adapt to a new challenge. However, when control is exerted over information and/or materials, these nodes are weakened, groups are incapable of forming networks and comprehension becomes problematic and limited to the person controlling the interaction.

In SOLE, comprehension emerges when its individual parts connect to form networks of knowledge (Downes, 2012). These networks of knowledge depend on participants knowledge and accessed Internet information, indicating that knowledge is located internally within individuals but also externally in appliances such as the Internet. Therefore, the parts of the system, participants and artefacts present individual characteristics that allow them to connect for self-organisation. It is in the richness of these characteristics that the system connects, self-organises and comprehends information. Although participants differ in all personal aspects, these differences are not as substantial as to impede self-organisation (Davis and Sumara, 2006), that is, a similar skill level is needed to prevent control over SOLE activities by a substantially more skilled participant (e.g. an adult). This system is formed and maintained by the small similar parts that fuel its existence always in the face of a challenge.

Furthermore, although some students are better at reading than others, rather than creating a hierarchical division in the group, this situation forces the better prepared peer to build arguments to justify a choice, explain a thought process, explain words, that not necessarily result in others agreeing with him/her. Then, the more knowledgeable peer poses a challenge that allow others to self-organise and comprehension to emerge or a decision to be taken.

For these individual characteristics to favour self-organisation, they need to be enabled by student's willingness to collaborate with others. In phase 1 and 2 of this study, students seemed equipped with social and cognitive skills needed to solve the given texts in phase 1 and Internet information in phase 2. They collaborated for comprehension to emerged. However, in the pilot study, students refused to collaborate and therefore problematic behaviour emerged. This indicated that either students needed a better activity, or they needed to learn how to collaborate. However, when asked, students clarified that the problem was the activity as they did not find a purpose to complete it. This was corroborated in phase 2 when problematic behaviours observed in the pilot study changed. Challenging behaviours noted in phase 2 were related to sharing the materials, students' disagreement about the information found in the Internet, or personal issues that occurred elsewhere. What is remarkable here is that most of these behaviours were related to the willingness to answer the big question rather than unwillingness to complete the activity.

Perhaps, what is attractive to students when researching from the Internet is that it is a more interesting way of learning because of the given control of what they search and choose/discard. In the Internet they can follow curiosities to unexpected places. For instance, in session 6, a group of students were searching for the answer to, "How to power a light bulb with wind?" After a few unsuccessful searches, the group decided to type the question in YouTube. As the scribe is typing the question, text-predictor offered some questions and as they read the options, they laughed and asked the person holding the mouse to click on them, making comments of how funny and fun it would be to watch content related to the option. Then, someone in the group reminded everyone that they have to answer the big question and therefore finished typing in it, indicating that the big question helped students maintain focus. Later, when they completed the search, students were observed watching videos related to electrical failures.

Another interesting point is that in the pilot study students sometimes read the entire text while other times they read the first paragraphs, then moved on to read the questions to be found in the text, which is the format followed in SOLE. It seems that big questions beget curiosity begets purpose. The difference in the nature of the questions for phase 1, pilot study and phase 2 makes the search different: students were more interested in finding answers to the difficult big question than answers to

questions that were limited to one text. Perhaps SOLE appeals to our natural human tendency to follow our own curiosities, rather than completing purposeless activities.

Coiro (2011) suggests that prior knowledge -among other reading comprehension predictors in offline texts- is not essential for comprehending information from the Internet. In SOLE, participants' prior content knowledge does not affect self-organisation. On the contrary, when participants lack knowledge of a word or content, this initiates a network for understanding where students look for the meaning of the word or discuss content until understanding emerges. However, when present, prior content knowledge facilitates answering a question: for example, when students make connections with content learned in prior SOLE sessions or in other settings. Content knowledge although useful is not a precursor of self-organisation, the lack thereof is usually a trigger for self-organisation as knowledge also resides outside individuals in appliances like the Internet (Downes, 2012). For this reason, participants—despite age and knowledge—could comprehend and answer big questions.

Prior reading knowledge did not affect self-organisation. Students had different levels of decoding and reading skills. Some participants needed assistance with decoding and comprehension, while others helped correct miscues and misunderstandings: when in SOLE, the system self-corrects. For this reason, comprehension is not affected by poor decoders but enhanced when participants form networks for reading. Other knowledge of reading such as strategies for comprehension were supplied in interaction when students discussed text meaning or made suggestions as for how the content of a text could be used to answer the big question.

There are three components that are precursors to self-organisation in SOLE. The first, physical set-up of the SOLE laboratory: a space to enable collaboration by placing large TV screens in a half-moon shape around a room for anyone to see the information, in addition to benches for students to sit comfortably close to each other in front of the TV. Second, collaboration is the ability of students to work together to find an answer to a given big question. Third, the Internet is the external appliance where knowledge resides and what makes students self-organise due to the vastness of its information.

Physical appearance of the SOLE laboratory is designed to allow networks of interaction to form around the challenges placed by big question and Internet. Figure 5.2 shows SOLE laboratory in New York City. The height of the blue benches where

students sit and the place where TVs rest was purposefully designed for anyone standing inside the half-moon shape to see the information displayed on TVs. Often, when students in the study walked around or just look to other people's TVs from their own station, they were able to see and transport that information to help their group find an answer to the question. For instance, students were observed asking a teammate, "How did they get to that page?" and subsequently, someone brought the information to the group and a new search began. If the TVs and benches, were placed in rows, the connection between participants and artefacts would have been more challenging and self-organisation difficult to achieve.

Figure 5.2 SOLE Laboratory, New York City

What really affects comprehension in SOLE is lack of group collaboration. As discussed in phase 1, text complexity, teacher guidance, and peers as tutors do not longer matter. What really matters in SOLE is collaboration to allow diversity of student thought, ability to listen and speak up, ability to compromise, ability to question understandings, and ability to allow other's understanding to be heard to make a best choice. For example, some students had better prior knowledge that allowed them to comprehend text, but if they could not communicate it to the group then the group would not advance in finding the answer.

Morrison (2008) cautioned that for self-organisation to occur, organisms need to be able to connect, cooperate and compete. In SOLE, when participants are unable to work together and connect to solve the big question, self-organisation, and thus learning, hardly occurs: participants' distributed knowledge and ideas are staggered by their own inability to connect, cooperate and compete, thus impeding the evolution of the system.

This is evident in session 14, when a girl in the group decides to research independent of her teammate: she did not consider his opinion but imposed her choice, while the teammate did not stop her. As a result, the group was unable to form networks because of the lack of connection in their interactions.

This brings us to the point made about the traditional scaffold of teaching students how to collaborate prior to reading activities. In SOLE, this scaffold becomes unnecessary because the search for answers lets collaboration to emerge. That is, depending on the difficulty encountered by the students (e.g. sharing a mouse, choosing the appropriate link, understanding a text, or typing questions), students' collaborative skills emerge to help pass the given challenge. For instance, in session 12, a girl is unsuccessfully trying to read aloud the word "Metal". She makes several attempts and says, "Medals? Metals? Materials? Middles?". When she becomes frustrated a teammate says, "Metal". Although it seems that this is a reading skill, the willingness to help and/or correct a peer in need is what motivates this interaction. Nonetheless, as in phase 1, it cannot be implied that teacher as a provider of scaffolds did not influence the ability of student to collaborate and read in this study. Classroom instruction as well as the learning in other settings are specialised networks of interaction that allow students to collaborated and therefore, self-organise in SOLE.

Complex systems respond to a random factor (Davis and Sumara, 2006), in the case of SOLE, the Internet. Data show participants responding to challenges placed by Internet: choosing appropriate links with potential to answer big questions, reading articles to construct an answer, discussing one-word answers, discarding useless information and finding meaning of unknown words. They scout for information and navigate through useful/useless texts to arrive to an answer. This random factor, the Internet, is a complex system and it presents participants with constant challenges allowing them to self-organise for comprehension. This is first appreciated in links found when a search is conducted. Participants read quietly/aloud, discuss, decide and discard links to find one suiting the big question.

According to the findings of this investigation and others (Coiro, 2014; Leu *et al.*, 2017), there is a major shift from offline reading comprehension to information comprehension of the Internet. In this study, individual efforts to read complex texts, as shown in phase 1, does not allow for comprehension to emerge. In SOLE and perhaps in other settings, information comprehension is enabled by group collaboration.

Therefore, the major shift is that reading comprehension has become a skill rather than the goal of reading. The vastness of the Internet requires other abilities for students to navigate, learn and comprehend.

It can also be said that comprehension -as learning and knowledge - happens outside the individual (Downes, 2012). In session 8 and in other sessions, students used information from other Internet users who had posed the answer to the question they were looking for, or at least a similar version. Therefore, it can be implied that the individual(s) posing the answer to the question had undergone some process of comprehension where the emergent phenomenon was the answer to a given question. It seems that comprehension of someone else's comprehension forms a nested system where individual(s) release the information in a website that will be accessed by other people such as the students in this study. This comprehension happens external to the individual, which highlights the need for other skills such as ability to differentiate right from wrong information, trustworthiness of accessed materials, ability to discuss with others but also compromise on what constitutes an answer to the big question.

Another factor that can be identified in the data is that comprehension happens because a specialized network is formed to surpass specific challenges posed when researching big questions. For instance, in session 12, students argued about the difference between the words "Electricity" and "Heat". While some students believed they were the same words, another student tried to convince them that they were different. In order to comprehend the difference between these words, specialized knowledge had to be used for comprehension to emerge. Interestingly, in this interaction students did not have to verbally explain the difference for comprehension to emerge or for students to even agree that they had comprehended. In its place, reading the subsequent information in the webpage was sufficient to understand why the two words did not refer to the same information and therefore the website could not be used to answer the big question. This demonstrates the strength of specialized networks for comprehension to emerge.

In SOLE, complex systems constantly arise through the interaction of each participant with others and artefacts in the face of a random factor that creates chaos and forces the system to adapt. However, for self-organisation to occur, an environment of chaos and connectivity must be "let happened", that is, conditions such as the physical appearance of the SOLE lab (i.e. Environment) can be set up but control over students' behaviours, choice of websites and even disruptive behaviour (e.g. Minor arguments and

disagreement) has to be “let happened”. Under these conditions, the system self-organises, and the emergent phenomenon is comprehension. Then, it is implied that comprehension is not taught, or made happened, comprehension -if let happened- emerges.

5.3.1 Relationship to prior research

Considering the new need for students to learn from the Internet, which exposes them to a diversity of complex information (e.g. texts, images, videos, hyperlinks, etc.), prior research indicated a need to investigate more collaborative and socially mediated approaches for the emergence of comprehension with young students (e.g. fourth-graders) for the promotion of 21st century skills. Prior research either portrayed the efforts of older students reading individually on the Internet without adult assistance (Coiro, 2014), performing online activities in groups using adult created scaffolds (Kiili, 2013; Kiili *et al.*, 2016) or scaffold peer collaboration for reading offline material (Rojas-Drummond et al., 1998; Wegerif et al., 1999; Morgan et al., 2000; Rojas-Drummond and Mercer, 2003). This study lifted the use of such scaffolds to investigate if young students would comprehend complex information when working in groups.

Research studies in Self-Organised Learning Environment (SOLE) as posited by Mitra (2014b) have not addressed comprehension for Internet activities. They have mostly focused on student improvement on different academic areas (Mitra and Rana, 2001; Mitra and Dangwal, 2010) and personal growth (Dangwal and Kapur, 2008; Dangwal and Kapur, 2009). A literature review failed to find research explaining how young students comprehend information found on the Internet when in SOLE. In order to uncover how this happened (i.e. question 3), this study first unveiled how self-organisation emerges in the SOLE arena, specifically the different contributors leading to emergence of comprehension: participant’s ability to form and dismantle networks, cooperation, ability to argue and compromise, ability to decode written material, discuss and propose new ideas, and ability to use artefacts present in the SOLE laboratory.

This study shows that SOLE is a powerful approach to undertaking the intricacies of the Internet. In SOLE an environment that enables self-organisation is created by adults: the limited number of computes or TVs, the size of the TVs, the big question and the rules create an environment for students to participate in a way that their ability to collaborate, communicate, form and share ideas, emerge. This environment does not

force or make comprehension happen, it sets the environment for comprehension to happen.

Then, if comprehension is enabled rather than taught or made happened, former scaffolds (e.g. Teacher instruction and peers as tutors) take a secondary role in student participation of online environments. Internet research and comprehension require skills beyond reading comprehension (Coiro, 2014). This study shows how students' conversations, disagreement and agreement is required to confront and pass the challenges posed by the Internet. What is interesting is that these new required abilities are not exclusive of reading or Internet research activities but found in common human interactions. Children learn to argue, express their ideas, compromise and disagree just through interaction with adults and other children. This study brings attention to human interaction for the emergence of comprehension. It contributes to the research of SOLE by explaining how its mechanism allows self-organisation and hence comprehension to emerge.

This investigation also contributes to research in peer collaboration. Studies about group reading offline material have always been done within the parameters of three common scaffolds: teacher intervention prior to group work (Stevens et al., 1991; Rojas-Drummond and Mercer, 2003; Rojas-Drummond et al., 2014), teachers and/or a more capable peer as mentors (Wegerif et al., 1999; Morgan et al., 2000), and materials at the students' reading levels. The need for these scaffolds has been made obsolete by the introduction of the Internet. As previously discussed, it was noted that prior content and reading knowledge take a secondary role in SOLE, then peer collaboration becomes the central tenant -along with artefacts and physical space arrangement- to allow the emergence of comprehension. However, teacher instruction -in any form- cannot be discounted yet as studies in SOLE have not been conducted in the absence of it.

In regard to the role of teachers in group enterprises for comprehension, this study shows how in SOLE this role changes. Although comprehension needs to be let happened instead of scaffolded, in SOLE the role of the teacher or adult is to ensure the environment for students to work at the edge of chaos, where comprehension emerges. That is, a challenging environment with a few rules to instigate chaos and a question to bring a focus of interaction to the group. Therefore, teachers' focus is on ensuring proper Internet and computers, physical environment for students to form connections and a big question aligned with the curriculum expectations to entice students to

research for answers and collaborate. In SOLE teachers become attentive to student collaboration, conversations, questions to instigate groups to continue a search, quality and trustworthiness of access information, and continues ways to allow self-organisation to happen.

The role of peers as tutors also change. In SOLE, a more knowledgeable person can hinder self-organisation if this person dominates the interaction (e.g. Teacher, adult or peer). However, if a more knowledgeable peer collaborates with the group, this person does not take the role of a tutor (e.g. A dominant role) but the person who challenges teammates to self-organise for comprehension and ultimately for learning. In addition, it has been observed that in SOLE students are knowledgeable in different areas: some students are excellent decoders of words, others are excellent at typing, summarising information, bringing new ideas to find answers to the question, making connections with past experiences and content knowledge and others keep peace and order for the group to be able to self-organise. It is in the richness of the group as a whole rather in the expertise of one team member that groups thrive in SOLE, making peers as tutors inadequate in SOLE activities. This investigation further the understanding of group collaboration and peers as tutors for Internet search and comprehension.

This study created the first graphical representations of a SOLE system (Figure 5.1). This graph shows the complexity of interactions formed when trying to solve a big question. It portraits the big question as the source of perturbance or element altering yet giving order to the system It shows the struggle of the system to overcome challenges by the connections between participants and artefacts always in response to the challenges, indicating a non-cyclical and non-linear process. It shows how networks are formed, dismantled yet information is learned in the history of the system.

This graph is limited to the events portraited in this study. That is, only instances of chosen sessions are represented here. As mentioned before, other complex systems are either connected and other nested in the events represented here. For instance, in a discussion about the information shown in a website, a student refers to a past big question to show use the information learned then to answer the present question. This reference makes the group think about the information on the website in a different way. In other words, there are other nested systems that spontaneously form while the hosting system is still in action.

Finally, based on the results of the pilot study and phase 2, students demonstrated great disposition to work uninterruptedly in SOLE, contrary to the behavioural issues displayed in the pilot study. As noted in interactions recorded in the data, in SOLE sessions, students displayed other behaviours considered disruptive for classroom settings: arguments, disagreements and fights were related to individuals desire to type the question, choose a link, ensure an idea across the team, suggest an answer to the question, and other forms of collaboration leading to answering the question. In SOLE, these disruptive behaviours are necessary to challenge the group to self-organise for comprehension, which brings a new idea to the practice of SOLE: adults embracing disruptive but safe behaviours for the advancement of learning.

5.3.2 Trustworthiness of phase 2

Findings for phase 2 are evaluated through Lincoln and Guba's (1985) trustworthiness in qualitative research. This framework is selected because of its compatibility with the theoretical framework and research paradigm: trustworthiness and its four components have been studied and applied in naturalistic research, that is, for studies taking place in natural contexts. Although the context of the SOLE laboratory does not resemble a typical school classroom, it is still considered a natural context in the hosting school as the SOLE laboratory is used on a daily basis and its approach has become a learning tool in the school.

Trustworthiness was evaluated under a four-component criterion: credibility, transferability, dependability and confirmability (Lincoln and Guba, 1985). In this sense, credibility of findings was evaluated through triangulation and peer debriefing. Triangulation in Lincoln and Guba's (1985) sense is the ability of the researcher to use multiple sources to provide a robust account of the phenomenon of study. In this investigation, triangulation occurred at the data collection and theoretical levels. Due to the importance of participants' interactions with each other and the artefacts found in SOLE, a rich set of methods of data collection allowed the reconstruction of the reading activities in the context of SOLE. Although audio recordings were the main data form used for analysis, observations and screenshots of websites provided a richer description of the phenomenon, where network formation/abandonment or absence of a network for comprehension was established. The theoretical framework for this study used elements of Complexity Theory (Davis and Sumara, 2006) and Connectivism (Siemens, 2005). This allowed for a rich description of self-organisation in young

students where the emergent phenomenon is comprehension. Finally, the last component was the use of theoretical and peer debriefing to establish credibility of the study.

Peer debriefing refers to the review of the data analysis and findings to uncover important information unintentionally ignored by the researcher. For this, a peer teacher and an outside expert were invited to look at the data. First, the teacher, although familiar with the SOLE laboratory in New York City and its practice, she was unfamiliar with the SOLE approach at the theoretical level. She was provided with unidentifiable data for three different sessions of the study, data analysis procedure and SOLE Cycle to Answer Big Question. The principal researcher met with the teacher to clarify procedures and prevent confusion and once the teacher performed the analysis, she acknowledged points of convergence and divergence in the data analysis. This provided a better perspective into the data and its meaning in context. After discussing these points, the principal researcher made adjustments that improved the richness of the analysis and findings.

In order to establish dependability and confirmability of the study, an enquiry audit technic (Lincoln and Guba, 1985) an outside researcher was used to provide feedback regarding the process (i.e. evaluation of dependability) and outcomes (i.e. evaluation of confirmability) of enquiry. This auditor evaluated all aspects of the present research including data analysis, findings, and effectiveness of the theoretical framework and literature review in explicating the phenomenon at hand: self-organisation. Upon recommendation, data analysis was enriched with concepts discussed in the findings to provide a more cohesive body of research.

Lastly, transferability of findings (Lincoln and Guba, 1985) was ensured through the richness of descriptions so that others are able to use findings elsewhere. First in the study, the sequential line of enquiry that concluded with an approach to Internet research in collaborative groups not only provided a rich set of activities and physical setting, but also a description of the impact of a radical switch (i.e. activities in a classroom as compared to activities in the SOLE laboratory). Second, Chapter 4 provides a “thick description” as envisioned by Lincoln and Guba (1985) in which self-organisation is evident in all but a deviant case. This intense description clearly exemplifies what network formation, abandonment or lack thereof appears like in

SOLE situations for others to apply in similar settings. Finally, the description and image of the SOLE laboratory facilitates the envisioning of such activities.

Overall, different techniques were used to established trustworthiness of the study. For this, the four main aspects of trustworthiness were addressed, which in turn provided a comprehensive and cohesive account of phase 2 of the study.

5.4 Theoretical implications

This investigation contributes to the study of Complexity Theory in education (Davis and Sumara, 2006; Morrison, 2006) and Connectivism (Siemens, 2005; Downes, 2012). It explored a complex system in collaborative activities for educational gain by providing insight into how complex systems of intricate networks forms, self-organises, and evolves for comprehension enterprises.

First, the characterisation of a complex system as those formed in SOLE, contributes to the study of complex systems in school environments offering a modify space -SOLE laboratory- as an alternative to learning in Internet environments. For instance, the lack of hierarchical structure and removal of teacher assistance in SOLE contributes to the idea that self-organisation is facilitated by highly connected networks (Siemens, 2005) where the individual parts have similar characteristics (Davis and Sumara 2006) and therefore are capable of connecting to overpass a challenge. Furthermore, through comparing the results of the pilot study and phase 2, it shows that when materials where chosen *for* the students instead of *by* students, this control over the materials did not allow the emergence of networks for comprehension; it could be said that the control by an adult over the materials impeded self-organisation. This is a finding that contributes to understanding how self-organisation is not an effect of a given input but the emergence of networks by setting up the appropriate environment and allowing connections to happen.

The creation of a SOLE laboratory where the artefacts of interacting enable self-organisation, contributes to the understanding of how initial conditions can be provided by educators for self-organisation, learning and comprehension to occur. This contributes to Siemens' (2008) idea of the job of the teacher as a curator, "I suggest that educators must assume dual roles: as experts with advanced knowledge of a domain and guides who foster and encourage learner exploration" (p. 17). Although for Siemens

(2008), the teacher is to intervene so that students are not discourage or lost in the vastness of knowledge offered by environments such as the Internet, in SOLE the point of convergence that allows students to explore the Internet with a maintain focus is the big question where the teacher intervenes through the creation of the big question. Therefore, this combination of question and vast Internet research contributes to the theoretical understanding of complex systems with practical important implications as the new role of the teacher.

A second important contribution to Connectivism (Siemens, 2005) is how the strength of the nodes of connection in interaction in SOLE determine the success of comprehension. That is, for Siemens (2005) learning occurs when nodes of information are connected, in addition to the strength with which these nodes connect. This study shows how student collaboration or lack thereof enabled or discouraged comprehension. Groups of students for whom collaboration was enabled through discussion, conversation, disagreement and even discordances, were able to pass challenges found in Internet searches. However, for those groups where ideas were ignored, and discussion was friendly yet unrelated to the information presented in the Internet, comprehension was hindered and the big question was left unanswered. This shows the importance of the strength of the network nodes that allows learning (Siemens 2005) and comprehension to emerge.

Then, the graphical representation shown in Figure 5.1 presents with a new visual element of how this system forms and evolves. This new element contributes to the theory of complex systems, their connectivity, evolution through space and time and the elements encouraging self-organisation by showing how all these elements working together for the emergence of comprehension. It also provides an initial point of discussion into other complex systems formed in SOLE in comparison to adult/teacher selected activities, SOLE laboratory and classrooms.

In brief, the results of this study contribute to Complexity Theory in education (Davis and Sumara, 2006) and Connectivism (Siemens, 2005). For Complexity Theory, it characterises a self-organising system showing how young students form and abandon networks of interaction when confronted with challenges in the Internet, hence the emergence of comprehension. It shows the first graphical representations for processes of solving questions in SOLE and a Complex System for information comprehension. Similarly, it shows how a highly connected networks entices learning (Siemens, 2005)

and comprehension with implications for the roles of the teacher as an environment curator (Siemens, 2008).

5.5 Practical implications

This study has important educational implications related to reading instruction and practice, Internet search and comprehension (Leu *et al.*, 2017) and Self-Organised Learning Environments (SOLE) (Mitra, 2014b). It is difficult to imagine a day without engaging in the act of information comprehension. The introduction of the Internet has made research and comprehension one of the most important skills needed to succeed in college, the work force, and in daily life. Internet research and comprehension have determined 21st century skills (Learning, 2009) and the skills needed to succeed in the workforce (Casner-Lotto and Barrington, 2006). Unfortunately, our current educational system is known for neglecting such practice, with most prominence in elementary schools. For instance, the Common Core Standards (CCSS) of the United States determines what should be learned in schools today (EngageNY.org, 2012). However, the Internet as a learning tool is only introduced in the standards after the fourth-grade level. Since offline reading is taking a secondary role in college and the workforce, this leaves students with limitations in learning how to deal with the intricacies of research and comprehension in Internet environments. SOLE is a gentle, organic and simple solution to this problem. In this study, young students showed the benefits of using the Internet as a research and learning tool. Therefore, allocating instructional time for SOLE provides opportunities to better prepare students for college and work environments.

The CCSS has recommended a higher bracket of reading complexity according to the school grade level of the students (EngageNY.org, 2012). This investigation demonstrates that young students are capable of reading texts that are more complex for their reading levels when in groups, with access to the Internet and unaided by adults. In addition, it shows how the role of the teacher changes in SOLE from teaching and guiding to setting up environments that trigger self-organisation. The ability to provide students with complex texts and other environment for learning gives teachers opportunities to set classroom environments for students to teach each other about different academic subjects while practicing other important skills (e.g. collaboration, communication and argumentation). Teachers can supply students with complex

academic texts and/or SOLE sessions to research different subjects and/or develop research projects.

Another practical implication is the opportunity to practice skills and strategies taught in class while learning academic content. As Mitra (2014b) showed, parts of the curriculum can be taught through SOLE. This investigation shows how students use the skills and abilities they have to overcome difficulties, and in this process, they learn and comprehend. SOLE is a positive and non-threatening environment for students to develop and reinforce these abilities while collaborating with other peers. In addition, SOLE is a great space for teachers to conduct observations and evaluations for the reflection and improvement of their own teaching practices.

The graphical representations of SOLE (Figure 5.1) has the potential for assisting researchers, practitioners, and educators in better understanding and furthering the research and practice of SOLE. First, the graph provides a visual to understanding how students overcome difficulties in Internet research, while providing an explanation of why the results of a SOLE session are difficult to predict. The graph also provides opportunities to better understand the role of the adult, first in the importance of setting up the environment, second the importance of letting comprehension and learning happen by preventing interruptions in the self-organisation process through adult input, and last when considering feedback loops where adults can further challenge the system to continue self-organising.

Overall and most importantly, this study asks for a new focus on collaboration rather than in reading skills. Reading is an essential skill for learning, however, Internet comprehension asks for more sophisticated skills, among them, collaboration with others, digital wisdom, evaluation, critical thinking and problem solving (Coiro, 2011). The Internet has become such as vast place that information processing and learning is highly dependent in networks where knowledge is contained in internal (e.g. individuals) and external (e.g. Appliances) entities (Downes, 2012). For all these reasons, SOLE offers a simple and organic solution for students to self-organise for the emergence of comprehension.

However, such a simple solution [SOLE] for a complex problem such as offering 21st century education in American schools, still must endure the politicised and capitalized education arena impeding its implementation. In the review of the history of

schoolbooks presented in chapter 2, it was clear how just the selection of what children read in schools is dependable upon educational policy, political affiliation, profits made by publishing companies in arrangements with researchers of education. Once again, as Bowles (1976) stated:

> The educational system, perhaps more than any other contemporary social institution, has become the laboratory in which competing solutions to the problems of personal liberation and social equality are tested and the arena in which social struggles are fought out. The school system is a monument to the capacity of the advanced corporate economy to accommodate and deflect thrust away from its foundations. Yet at the same time, the educational system mirrors the growing contradictions of the larger society, most dramatically in the disappointing results of reform efforts. (p. 5)

SOLE, as other educational approaches must endure the rigid structures placed by policy and political issues in education conceived under capitalist ideals. For instance, programs such as Apple Classrooms of Tomorrow (ACOT) demonstrated that the combination of technology, teacher training and Enquiry Based Learning can have positive impact in students, teachers and schools at large. ACOT, an Apple initiative, was launched in 1984 with the purpose of observing the impact of introducing technology in K-12 classrooms (Sandholtz *et al.*, 1992; Ringstaff *et al.*, 1996). Although important to highlight that the initiative had positive outcomes in students engagement, critical thinking, problem solving skills, and teachers' empowerment to become the leaders of their schools and districts, it is also interesting to note that ACOT addressed the same issues faced in schools in America today: teacher understanding and acceptance of technology in the classroom, mismatched assessments for what constitutes important to evaluate in these technology oriented classrooms, the change on the role of the teacher and the acceptance that educational change takes time, teacher training, trial-error-reflection practices and compromise of some of the educational structures impeding change in our classrooms.

Another of such efforts is Schools for Thought (Bruer, 1994). This Enquiry Based approach was materialised in a collaborative effort to bring together three different approaches: Fostering Communities of Learning (Brown and Campione, 1996), Computer-Supported Intentional Learning Environment (Scardamalia *et al.*, 1989), and Anchored Instruction (Vanderbilt, 1990). The basic premise of this approach was to introduce technology in the classroom with the purpose of developing Enquiry skills and a sense of purpose for learning. Schools for Thought demonstrated positive impact in a technology and enquiry based environment where teachers fostered problem-

solving and other higher order skills (Lamon *et al.*, 1996). In this approach not only did students improve higher order thinking skills and cognition but they also reported better attitudes towards school.

These and other attempts to bring the education of children to the 21st century, although successful in their endeavour, did not expand to match the need for such school reform. The unwillingness of governments, politicians, companies and other stakeholders to change the rigid structures of the educational systems in America and elsewhere threatens progressive initiatives as in the case of Summerhill School (Stronach, 2005). This democratic school is well-known in the world for applying the principals of democracy into every aspect of the school: students are part of making the rules and policy of the school, building their own course work and making judgement and decisions when issues arise. Despite of the longstanding tradition of Summerhill School in educating students with high values, strong voices and academic achievement (Stronach and Piper, 2008), a routinely government audit in 1999 threaten to close the school because the Summerhill's approach entered in conflict with what the auditing entity valued as proper education. For instance, it was reported that class attendance was low, students were often seen wondering the schools, students had too much responsibility on deciding the curriculum and other activities in the school, and the curriculum was fragmented. This audit failed to acknowledge or value the reasons for all these findings in the school, in other words, it was unable to recognise the democratic approach to education that this well-established school had been successfully implementing. Ultimately, Summerhill School was able to dismiss the appeal to close the school and its long democratic education tradition.

Although the efforts of these programs have failed to expand to educational systems at large, a plethora of schools and approaches have emerged in the last two decades offering alternative models. In addition, considering the availability of technology and the Internet in schools in the present time, these individual but numerous efforts are taking stand in the small communities they serve. For example, High Tech High, is a semiprivate K-12 school in America with a combination of Enquiry Based Learning and vocational education, where technology is a tool for enquiry rather than the centred of instruction (Rosenstock *et al.*, 2007). In their approach, students from kindergarten to 12 grades engage in solving real life problems with the potential to solve community

issues. As a result, students from diverse backgrounds graduate to pursue college and career goals.

SOLE is a rather simple approach to learning for educational systems with the infrastructure to support Internet research. SOLE has been used in over 100 countries at the classroom, school, district level as well as in educational centres and libraries (The School in the Cloud, 2017). However, SOLE is yet to endure the rigidities of the well-established traditional education system as the approaches explained above. For SOLE and other such approaches, compelling evidence, policy reform, relationship with companies and other stakeholders need to be developed from interested people at the grass-roots level: educators, families and students. Only then, some new order will emerge where better-fit education is provided to all kinds of learners.

5.6 Limitations of the study

The findings of this study are limited to a specific population of fourth-graders in New York City. Parts of the study took place in three different schools, with a student population of similar socio-economic backgrounds as most of the fourth-grade population of the public schools of New York City. Therefore, findings could be generalised to this population. Additionally, skills displayed by students in the study are suspected to be common of students of diverse ages, gender, socio-economic status, and nationality. That is, collaboration, cognitive and social abilities used to solve texts are not unique to the aforementioned population since they were not taught during the investigation, but they emerged when the students were challenged to solve complex texts and big questions.

A second possible limitation is related to the setting in which this research took place. The newly built SOLE laboratory of New York City has been constructed to facilitate self-organisation. The physical elements and arrangement of the lab (i.e. size of TV screens, benches as opposed to individual chairs, TV stations arranged to form a half circle and a room intended only for answering big questions) are uncommon to educational settings. However, upon adoption of SOLE practices, individual teachers, schools and others interested in education have reported similar situations: children learning academic content together in SOLE-like environments. Additionally, this study has the potential to be generalized to other SOLE laboratories around the world: India, United Kingdom, Colombia, and Mexico, for the advancement of current practices.

5.7 Recommendations for future research

As seen in the literature review, research on collaborative reading activities has focused on the use of scaffolds to facilitate reading in groups and comprehension (Stevens et al., 1991; Morgan et al., 2000; Rojas-Drummond and Mercer, 2003; Rojas-Drummond et al., 2008). Findings revealed that fourth graders in New York City could read complex texts when they do it in groups with access to the Internet and in SOLE situations. Data also showed how students comprehend information when in SOLE. Based on the literature review and these findings, future studies could focus on extending this research to other SOLE laboratories around the world to test these practices against different demographic groups and non-laboratory SOLE situations (e.g. schools, community centres, home-schooled students, etc.), to discover how students mode of searching for an answer (e.g. watching videos, looking at pictures, reading articles, etc.) evolve as they gain more competence in searching, how are students integrating and synthesising information when answering questions, and how students test for truthfulness of information. These are discussed next.

This research could expand to other SOLE laboratories to build a more robust body of knowledge affirming or denying the findings here. The impact of reading in students from other laboratories could bring attention to how children from different demographic backgrounds comprehend Internet texts. It would also be important to test these findings against age (i.e. for younger and older readers), first and second language, high performing readers, and readers with special educational needs. This would help cement understanding of the process of self-organisation for information comprehension in children to enable generalization at a greater scale. Then, it would be beneficial to research if this process also happens in non-laboratory SOLE situations carried out by other educators around the world.

It has been informally observed in the SOLE laboratory of New York City that students under 6 years old are more inclined to use images and videos to answer the big question, while older students begin sessions watching videos but soon switch to reading as the preferred mode of finding an answer. Solving the following questions could build on this investigation and contribute to research in SOLE and peer collaboration: Can non-conventional-readers learn to read through the practice of SOLE? When does text reading take priority over images and videos and what is the

reason for this? Are images and videos precursors to reading comprehension in online settings?

Another important aspect to investigate in SOLE is how young readers integrate and synthesise the information they read when answering big questions. It is important for the advancement of Internet research to uncover how students value or devalue information and how they learn from the Internet. Then, this could lead to understanding how young readers assess for truthfulness of information—if they do it—which is more important than performing actual searches.

Perhaps more specific to SOLE is the importance of uncovering other complex systems influencing how students solve a big question. As mentioned in the findings, SOLE is a nested system in which comprehension emerges. It would be important for the advancement of SOLE to research laboratories elsewhere, focusing on how English-as-a-second language speakers form networks of collaboration to research big questions. This would not only help advance SOLE research but also research on English-as-a-second language.

Finally, an important aspect to address in future research is the long-term impact of SOLE in Internet research and comprehension abilities of all kinds of students. Due to the research practice regulation in the Department of Education of New York City, this aspect could not be addressed. However, this could entail a longitudinal study on aspects such as problem solving and critical thinking, which are usually elicited when students attempt to answer the big question.

5.8 Summary and conclusions

This study aimed to question and expand preconceived notions of the ability of students to read texts in groups, the need for traditional scaffolds, and the extensive need to control text complexity as a central measure for students to develop Internet research and comprehension abilities. Most importantly, this investigation intended to contribute with new ideas to a body of research concerned with better ways to prepare life-long learners and offer insight on a more collaborative and socially mediated approach for the emergence of comprehension as in the case of Self-Organised Learning Environment (SOLE).

Using a mixed methods approach, this study was comprised of two phases: phase 1 tested if fourth-graders were statistically significantly more capable of reading fourth and eighth-grade texts in groups with access to the Internet as opposed to individually; phase 2 showed how fourth-graders of New York City comprehended Internet information together.

The findings of this investigation contribute to the study of comprehending in groups and SOLE: fourth-graders in New York City were statistically significantly better at reading complex and at grade-level texts when they were in groups and Internet access is granted as opposed to reading individually. Also, fourth-graders self-organised for answering big questions in SOLE situations by forming and abandoning networks of interaction and the emergent phenomenon was comprehension.

From the use of Hornbooks (Venezky, 1987) to information comprehension, reading has substantially evolved. The Internet has exposed students to different challenges that go beyond reading skills and strategies. The present challenge is a matter of researching and comprehending a constantly contracting and expanding environment (i.e. the Internet) by which there is no right or wrong but for which we have created a bond impossible to ignore and, importantly, to address since it regulates our current social activity. Depriving our youngest from self-organising to develop ways to understand and benefit from the Internet is not only deflecting the problem but also ill preparing our children for future jobs and successful careers. SOLE addresses this new challenge in a socially mediated environment beneficial to many students.

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Appendixes

Appendix A: Sample Fourth-Grade Reading Passage

Food Chains and Webs
Taken from: http://go.grolier.com/

A food chain describes who eats whom. An oak tree grows leaves. A caterpillar eats some leaves. A bird called a towhee eats the caterpillar. A hawk eats the towhee. This is an example of a **food chain**. Every form of life is food for another.

Producers, Consumers, and Decomposers

Every food chain begins with a food producer. Oak trees and other green plants are food producers. They use energy in sunlight to make food.

Animals are consumers. They cannot make their own energy. They get energy by consuming (eating) other organisms. Some consumers eat plants. They are called **herbivores** (plant eaters). Caterpillars are herbivores. Some consumers eat herbivores. They are called **carnivores** (meat eaters). Towhees are carnivores. Some carnivores, such as hawks, eat other carnivores.

One more group needs to be added to food chains. These are the decomposers. They feed on waste from other organisms. They also eat the remains of dead plants and animals. **Decomposers** include insects, worms, bacteria, and fungi. They play a very important role in a community. As they feed on dead matter, they break it down into simple chemicals. These chemicals are returned to the soil or the water. The chemicals become available to plants and algae, which use the chemicals to produce new growth.

The Web of Life

A **food chain** usually has about six links. But most animals eat more than one kind of food and therefore are in more than one **food chain**. The **food chains** within a community are often connected and related. This network, or combination of food chains, is called a **food web**.

Scavengers and Predators

Sometimes there are special relationships between the members of a community. Some of the consumers are predators—they kill prey for food. Eagles, owls, wolves, and humans are predators. **Predators** are usually well suited for catching, killing, and eating their prey. They have keen senses of sight, smell, or hearing. They can detect other animals from far away. Many predators can move quickly to catch a fleeing creature.

Some animals are scavengers. **Scavengers** eat the bodies of animals that have died or have been killed. In this way they return the materials of the dead animals to the food cycle. Vultures and jackals are scavengers.

Symbiosis

Different species in a community may live together in special relationships, called symbiosis. There are different kinds of relationships. It depends on whether organisms win, lose, or "draw."

One form of *symbiosis* is commensalism. In this relationship one organism gains and the other seems to neither gain nor suffer. For example, a woodpecker pecks a hole in a tree while searching for insects to eat. Then it abandons the hole. A bluebird may make a nest in the hole. The bluebird has a new home. The woodpecker has lost nothing.

Another kind of symbiosis is parasitism. It occurs when one organism—the parasite—takes nourishment from another organism—the host—and harms the host in some way. Mistletoe is a parasite plant. It grows on trees by absorbing the tree's nutrients. The tree is weakened as a result.

Please answer the following questions

Please write the number of each question as you answer

1. In your own words, explain what is the difference between **scavengers** and **predators**?
2. What is a food chain?
3. Why are **food webs** needed? Explain
4. In you own words explain, what is **symbiosis**? Provide examples

Appendix B: New York State English Language Test Blue Print Rubric

This rubric is a modified version of the New York State English Language Test blue print rubric (Fields, 2009). Some elements were excluded and others added to tailor to this investigation. The rubric measured level of reading comprehension in a scale of 0 to 2 in which 2 represents the highest level of comprehension.

Score	Response Features
2 - point	Valid inferences and/or claims from the text where required by the prompt Relevant facts, definitions, concrete details, and/or other information from the text to develop response according to the requirement of the prompt Sufficient number of fact, definitions, concrete details, and/or other information from the text as required by the prompt Integration of information found on the Internet that is relevant to the question
1 - point	A mostly literal recounting of events or details from the text as required by the prompt Some relevant facts, definitions, concrete details, and/or other information from the text to develop response according to the requirements of the prompt A copied but relevant and accurate response taken from the Internet A partial answer
0 - point	A response that does not address any other requirements of the prompt or is totally inaccurate A response that is unintelligible or indecipherable An unrelated response
999	No response/don't know/missing

Appendix C: Informal Data Collection Observation Form

Observation date: _____ Recorder's Initials: _____

SOLE Big Question _____

Please refer to the following questions and description when recording your observation:

What are the participants doing to comprehend the texts accessed in the Internet when trying to solve the big question?

Please describe all behaviours displayed by participants when reading material from the Internet. These behaviours include but are not limited to: pointing to information on the screen, clicking on a link to access a page, reading out loud to the group, silently reading while other reads out loud, asking questions/seeking clarification/providing clarification relevant to the text and the big question, explaining to others what has been read, paraphrasing the information read, and refusing a website information because it is irrelevant.

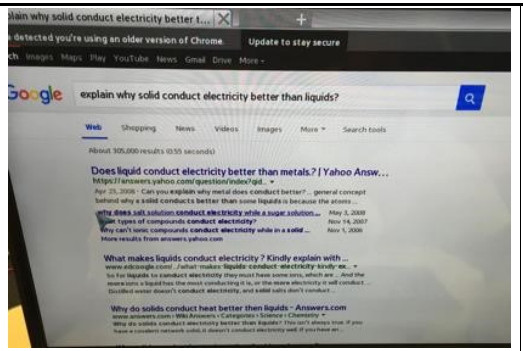
Record your observation here

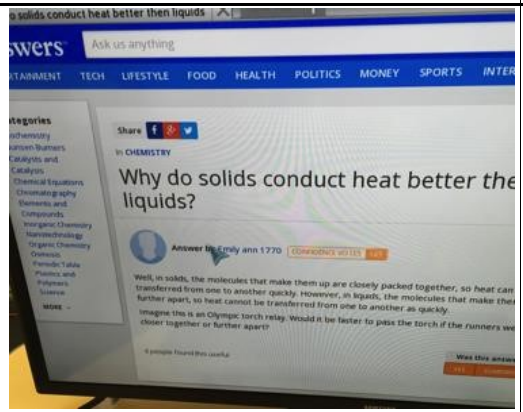
Appendix D: Sample of Segmented, Labelled and Classified Audio Recording

This is a sample of chosen segments of interactions and its analysis. Only some interactions were selected to portrait the analysis of interaction followed in this phase of the study

SOLE Stage What were participants doing to answer the big question?	**Transcript by Segmented Sequence of Interaction**	**Observation**	**Screenshot**	**Label and Description What were participants doing?**
Typing	**Boy 1:** I'm typing. **Woman:** What are you typing in today? [Typing sound] **Boy 2 & Boy 3:** Yeee. **Boy 1:** "Explain, why solids conduct electricity better than liquids?" **Boy 2:** "Explain Why, why solids...?" **Girl 1** "Conduct..." [Typing sound]	Boy 2 typed the question as it was given for the session and as he came to the first Google screen...	Not available	Type question verbatim: A participant demanded that he typed the question today. When asked what he was typing, he stated the question. Another participant dictated question verbatim, while the scribe recited the words he was typing. Another girl, who was following the typing, said the word conduct as to remind the scribe to type it.

	Girl 1: [Inaudible]...take turns. **Boy 2:** No, I don't. I don't. **Girl 1:** You all don't need to put "Explain". **Boy 1:** What the? **Girl 1:** Just put it in ask dot com. **Girl 2**: We don't need any advice. We wanna try to do on our own first. Jez. Can't people try first? **Boy 2:** Okay. Where in ask dot come do I get it from that we need to tell it to them first? We still have to type it. **Girl 2:** No, no, no. Type in the question first. Maybe it would be better to type the question first. **Boy 2:** We are. [Typing sound] **Boy 2**: I'm not gonna go no ask dot come, cause you gonna have to type the question on that site too. **Boy 1:** I know, write that. [Typing sound]	Not available	Not available	Idea, discard idea, use idea: While typing question, a girl from another group told this group that they did not have to type the word "Explain", which was part of the given question, and added that they should look for the question on www.answers.com. A girl from this group rejected the idea by saying they wanted to try it their own way and becoming upset. A boy from the group argued that it was unnecessary to use www.answers.com since they would still have to type the question. The boy reassured his teammate that they were already typing the question in www.google.com as she had suggested.

Link Comprehension	[Mouse click] **Boy 2:** That says, "Does liquid conducts electricity better than metals?" Boy 3 Yes. [Quiet] **Boy 2:** Look, see, it's right here. Wait. No, no, no it's not that. **Boy 3:** But wait. **Girl 2:** "Answers dot com." [Inaudible] [00:03:25]	... he [Boy 2] read silently the information in the links to the different websites. Boy 1 took control over the mouse and he waited for Boy 2 to indicate which link he could click on. They discussed why one link was better than the other, and then Jennifer joined the conversation and helped them choose one.		Reading aloud, comprehension, gain control, discard information: After accessing the links, the former scribe read the title of a link and then remained quiet in sign of thinking and reading. Then, he pointed out a possible title that could help solve the question, but when the mouse holder placed the mouse in a different link, he explained that it was not what they needed. A girl read the link to the website www.answers.com twice.
	Girl 2: Answers dot com. [Chatting] [Chatting] **Girl 2:** What are you guys doing? **Boy 2:** Come on. Leave. That's what I mean. [Chatting] [Mouse tapping] **Boy 3:** We can just use text [interrupted] and it'll be like.	Not available	Not available	Gain control of mouse, argument, regulate argument: As participants are reading the links, another participant moves the mouse around and a girl complained. They blamed each other for getting into trouble.

	[Mouse tapping] **Boy 1:** What are you controlling the mouse for? Jez. [Mouse tapping] **Boy 1:** Who is getting to trouble? **Boy 2:** That's you. [Inaudible] [03:53]			
Website Comprehension	**Boy 2:** It says, "While in solids the molecules that make up them are closely packed together, so heat can be transferred from one another quickly. However, in liquids the molecules that make them up are further apart so heat cannot be transferred from, from one to another as quickly" I did not hear the word electric or anything like that.	Although Boy 1 was quiet he was very attentive and controlling of the mouse. They clicked on a link but soon realised that it wasn't helpful so they went back to Google search to choose another site.		Reading aloud, explaining information, accepting explanation, idea: The boy arguing that the link was not related to the big question read the answer and said that the word electric was not mentioned in any part of the answer. A girl assented in understanding. Then another boy proposed to look for the word metals and the girl explained why the answer to

	Girl 2: Oh! [Mouse tapping and mouse clicking] **Boy 1:** Let's try metals. **Girl 2:** Because it has to have the word electric in it. **Boy 1:** What the? **Girl 2:** Not every answer has to have the word electric in it...[Interrupted]			the question was unrelated to the topic they were researching.
Discard Website	**Boy 1** What the? **Girl 2:** Not every answer has to have the word electric in it...[Interrupted] [Mouse clicks] **Boy 1:** Now it won't let us go back. **Boy 2:** It's because you went back too much. **Boy 3:** Exactly. **Boy 2:** Oh, so you are now going back to Google Search.	Not available	Not available	Express confusion, explain information, clarify problem: When the group realised that this link did not have the answer, they discarded the website and mouse keeper clicked back many times realising he could not access the return arrow anymore. A participant explained he had clicked too many times and thus they passed the Google Search page with the links related to the question and now they were in an empty Google Search page.

Appendix E: SOLE Stages Defined

Stage of SOLE	Beginning/Ending of Stage
Typing	Beginning: from the moment participant(s) express desire to type the big question or when keyboard sound is evident in the recording Ending: From the moment participant(s) click enter to access website links related to the question or announce they have access a page with links
Link Comprehension	Beginning: from the moment participant(s) click enter after typing the question, then read links out loud/quietly Ending: from the moment participant(s) voice choosing a link, click on a link or indicate typing the big question again
Use Link	Beginning: from the moment participant(s) express finding a link to use and/or clicking on it Ending: when the website or video is accessed
Discard Link	Beginning: from the moment participant(s) refer to a link as unhelpful Ending: when participant(s) mention a different link, stay quiet as in reading other links or the noise of a mouse scrolling down the page is evident
Website/Video/Image Comprehension	Beginning: from the moment participant(s) start to read the information or comment on any aspect of the chosen website Ending: when participants leave the webpage to pursue a different search or a different link
Use Website/Video	Beginning: from the moment participant(s) express the desire to use the information found on a website Ending: when participant(s) announce writing down the information or going to other website to obtain more information
Discard Website/Video	Beginning: from the moment participant(s) state that the video is not useful Ending: from the moment participant(s) click the return key to go access previous page, start reading the titles of other videos or choose a different video from the selection offered in the current page
Find More Information	Beginning: from the moment participant(s) announce that they have an answer but want to find more information about the topic Ending: when participant(s) access a browsing page and/or start typing the question again
Write Answer	Beginning: from the moment participant(s) announce they have an answer and they are going to write it Ending: when participant(s) write the answer

Appendix F: Transcripts of Recorded SOLE Sessions

Transcript Session 1

[Children talking throughout]
Woman Don't touch it.
Boy 1 She's recording our voices.
Boy 2 Wait, you use Google, right?
[Laughter]
Boy 2 No wonder he --
Boy 3 Girl 1! She's recording!
Boy 1 Has the thing he -- [crosstalk]
Girl 1 Press it!
Boy 1 Don't touch it.
Girl 1 Touch it!
Boy 1 No! I'm telling you. You want me to do it? [Crosstalk]
Boy 4 One dead dinosaur.
Boy 2 See, we are now studying and typing [inaudible] [00:42]. Snap!
Girl 2 Why did you press face?
Boy 2 I don't know.
Boy 1 Why would you press it if you didn't know [crosstalk]?
Boy 3 Backup the version all over.
Boy 2 No. I know every word.
Girl 1 Got to work together.
Girl 2 [Singing] "We're all in this together..."
Boy 2 Please stop, come on! [Crosstalk] Please stop!
Boy 1 You spell every word [crosstalk] --
Boy 2 I'm not denying. I'm looking at it too.
Boy 1 What are you doing?
[Laughter]
Girl 2 It's going to be hard for you to get out so -- I'm saying that it's...
Boy 2 I could just pull up that.
Boy 1 You're going to pick the table and then I can wait for them.
Boy 2 I'm not just going to pick one of those around.
Boy 4 You can sit on that.
[Laughter]
Girl 2 I'll sit on it.
Boy 1 You spelled the "settle" wrong.
Girl 1 No, she's not [crosstalk] right up there.
Boy 1 You should put an "i".
Boy 2 By accident.
[Laughter]
Girl 1 What?
Boy 2 I said people make mistakes.
Girl 3 Mostly, each other.
Boy 2 Each other? Okay.
[Girl whining]
Boy 3 What would we do without [crosstalk] --
Girl 1 Think faster. [Crosstalk]
Girl 2 Take so long to type!
Girl 1 I type faster. You want me to do it Jalani?
Girl 3 No, we work together, we will type it.

Girl 2 Oh, my gosh!
Girl 1 You type.
Girl 2 Enter.
Girl 3 No, it's supposed to be the question mark.
Girl 2 You're supposed to do [crosstalk] Google.
Girl 3 You're supposed to do puppet... [Crosstalk]
Girl 1 So you typed all that for nothing? Stop, what are you doing? [Crosstalk]
Girl 2 You're supposed to put it in Google.
Girl 3 Exactly.
Boy 2 I did press Google!
Girl 3 Exactly, that's why it looks like this now.
Boy 1 So put the...
Girl 2 The [crosstalk] --
Boy 1 Go to [inaudible] [02:45] history.
Boy 2 That might be the...
Girl 2 No, but Boy 1's going to try.
Boy 2 Okay.
Girl 2 What the...
Boy 1 Wait the [inaudible] [00:02:54] [crosstalk] --
Boy 2 No, this, to make it bigger.
Girl 1 I pressed that.
Boy 2 Let me read it.
Boy 1 It can probably [crosstalk] --
Girl 2 "The people have inhabited the areas of [crosstalk] –"
Boy 2 It can probably be implied [crosstalk] --
Girl 1 "Trail began as a Native American [inaudible] [00:03:26]."
Boy 2 Hold up, better go get my notebook.
Girl 1 "Train hunting is socio calling by Thud [phonetics] tribes including girls [inaudible] [03:30]." Go get my notebook, it is [inaudible] [00:03:34].
I will get my notebook.
[Children chattering]
Girl 1 Got it.
Woman We're not recording yet. They're not recording.
Boy 2 I can't.
Boy 1 Sit on a round thing. You won't let me [inaudible] [00:04:06].
[Laughter]
Boy 1 I'd kill myself. Look, it's Girl 2. She took -- busy turning.
Girl 2 Did not! Next thing you know, you all call me daddy [phonetics].
[Laughter]
Boy 3 It's a good thing. We don't have to leave our cards.
[Laughter]
Boy 1 I want this thing just like... Girl 2 is not a nose [crosstalk].
Girl 2 No, she's on a floor. Okay.
Boy 1 "They fifties, the five tribes of [inaudible] [00:04:45] [crosstalk] we're fighting and killing each other. According to the oral tradition [crosstalk] --"
Girl 2 Hold up! Where's the mouse though?
Boy 1 "Until the fifties, the five tribes of Iroquois developed much energy toward

fighting and killing each other. According to the oral tradition, it was about this time that they came to their senses and united into a powerful con..."

Girl 2 "The five tribes designed quite a elaborate political system that [crosstalk] this inclu..."

Girl 1 You said this --

Girl 2 Political.

Girl 1 Politico...

Girl 2 Po-li-ti-cal!

Girl 1 It's "Polilvill".

Girl 2 "This included a..." Blah blah! [Laughter]

Boy 1 You didn't even know the word. You tell me there's a "political".

Girl 2 I said this is political.

Boy 1 Are you telling me this [inaudible] [00:05:45]...

Girl 1 That word is the ease --

Girl 2 Much like the Quidditch -- I don't know how to pronounce the word.

Boy 1 "A modern U.S. Congress, they represent [crosstalk] --"

Girl 2 "The representative of S-A-chems [crosstalk] --"

Boy 1 "From Se..."

Girl 2 "From the Seneca and Mohawk tribes met in one house and those..."

Boy 1 Of the [crosstalk] --

Boy 2 "Broke ties and had a power of veto decisions [crosstalk] --"

Girl 2 What are you doing?

Boy 2 Why don't we all read that Girl 2?

Girl 2 Look, "Although the tribes began to work together, they surely did renounce war. They fought and captured other [crosstalk] native ties --"

Boy 2 Do you know what "fought" is?

Girl 2 I know!

Boy 2 Explain it.

Girl 2 "As well as --" [crosstalk] no -- "as well as wave after wave of..."

Boy 2 Okay. You act like you nobody is here.

Girl 2 You act like you don't!

Girl 3 I'm supposed to fight with [crosstalk] --

Girl 2 "European immigrants who presented themselves. They fought the early French and British settlers. During the French and Indian war, they remained officially neutral. But what joined either side to exploit and advantage. Both sides courted Iroquois support during the revolution. As a result, there was a split in the confederate..."

Boy 1 Where are you reading?

Girl 1 Oh my God!

Boy 1 For the first-time in...

Girl 2 First time in [crosstalk]

Girl 1 Confederacy!

Boy 1 "For the first time on over 200 years, Iroquois fought Iroquois once more." Here...

Girl 2 "The Long House was the center of Iroquois life. Equinologist... I'll get to know."

Boy 1 "Unearthed the Long House remains that extend more than the length of a football field."

Girl 2 That said, "Agriculture was --" [crosstalk]

Boy 1 That was actually good, the house is big. Exactly.

Girl 2 I know. That's sad.

Girl 1 How is that sad?

Girl 2 Because it's really long. "Agriculture was the main source of food. [Crosstalk] In Iroquois society, women held -- because there's a picture.

Girl 1 Exactly.

Girl 2 "Women held a special role. Believed to be [crosstalk] linked to the earth's power to create life. Determined how the food would be distributed — a considerable power [crosstalk] in a farming society.

Boy 2 Hello?

Girl 1 Say it to the phone.

Girl 2 "Women were also responsible for selecting the sachems for the confederacy. Iroquois..."

Woman Once I give you the paper, please get your notebook and don't touch your phones, okay?

Girl 2 Yes. Stop touching her phone.

Woman That gray room. [Mumbling]

Boy 1 Was trying to [inaudible] [00:08:48]

Girl 2 "Women were also responsible for selecting the sachems for the Confederacy [crosstalk]. Iroquois society was... [Crosstalk] No you because you [crosstalk]

Boy 1 Why can't I play the keyboard?

Girl 2 "When a marriage transpired, the family moved into the longhouse of the mother, and FAMILY LINEAGE was traced from her. The Iroquois society proved to be the most persistent military threat the European settlers would face. Although consist and treaty..." [Mumbling]

Girl 1 Everybody just...

Boy 1 I'm single.

Woman Write the answer on here.

Boy 2 Yes.

Boy 1 What are you doing? Where did you hide? [Children Chattering]

Boy 2 Can you all please work -- Jade you need to see. The [inaudible] [00:10:17] like that, Jade needs to see.

Girl 4 You can go see it. It isn't [Mumbling]. And he says that you are a liar!

Boy 3 I want to see.

Boy 1 I'm trying to [crosstalk]

Boy 2 You open it. It talks about a longhouse.

Boy 3 She took my seat.

Girl 2 It's says life of the Iroquois tribe says to each other and the longhouse and their family.

Boy 3 You're going to write with Cluster families? [Crosstalk] So you're going to write...

Woman Stop. Hands up. You have seven more minutes to answer the question. Keep going.

Girl 1 The Iroquois... Stop saying bad words. Thought I heard someone saying bad words. I'm trying to help.

Transcript Session 6

[Silence 00:00-33:18]
[Children chattering throughout]

Woman Lower your voices. Alright?
Boy 1 Okay.
Boy 2 The person.
Boy 1 You are recording, right?
Boy 2 "How to power a light volt with" -- [crosstalk].
Boy 3 What's wrong with this?
Boy 2 I don't know.
Boy 3 What the heck?
Boy 1 Just do right here. Cause that one is better.
Boy 2 Exactly, cause let me do it.
Boy 3 Hold up!
Boy 2 Who are you talking to like that?
Boy 3 You... off course.
Boy 2 I don't know you. Somebody who sounds like Michael
Boy 3 But I'm Michael.
Boy 2 [Imitating Michael Jackson's singing]
Boy 3 You don't even sound none like Michael Jackson.
Boy 1 "How to power a light bulb with wind?"
Boy 2 "How to power a light bulb?"
Boy 1 "Light bulb"
Boy 2 "Lightsss!" You know how to spell lights right? [Signing] Hit them with left, hit them with the right.
Boy 1 Do not spell Christmas.
Boy 3 Boy 1, come on! What are you doing?
[Laughter]
Boy 2 Okay. That's funny, that's funny.
[Typing]
Boy 3 "How to power...?"
Boy 1 This class are crazy.
[Typing]
Boy 2 "With wind". You gotta do it with wind. "With wind" [Spelling] "W-I-N-D". Enter.
Boy 3 Oh. You gonna have to pay for it. Click it!
Boy 2 No, that's all right.

Boy 3 Yo! What?
[Singing]
Boy 2 Better turbine. No, it's not the answer. Make it small one. No. You gotta go to two. Why doesn't it never gives us the real answer? We have to always search it up ourselves.
Boy 3 Yeah. It always talking about butt faces like...
[Chuckles]
Boy 2 Slow, slowly.
Boy 3 No.
Boy 2 A light bulb just for that much money? Mama would like, "Hey!" Which one?
[Making noises]
Boy 2 I was like...
[Laughter]
Boy 3 I already be like...
[Laughter]
Boy 2 Stoooop! Leave me alone. Leave me alone. Stop it!
[Thud]
Boy 3 What the, the?
Boy 3 Something went wrong! Something went wrong! Something went wrong! It's back on.
[Laughter]
Boy 2 If you're laughing too much. Hello, something happen on TV?
Boy 3 Where is it?
Boy 2 You don't have to put the, the whole question.
Boy 2 Why are you all on YouTube? You are not supposed to be on YouTube. Are they supposed to be on YouTube -- [crosstalk] Everyone's on YouTube?
Woman If you wish to.
Boy 2 If we want to? Oh Hell yeah! Go to YouTube.
Boy 1 I don't know. When...?
Woman Well, if it answers the question go for it...
[Typing after Woman said it was okay to use YouTube]
Boy 1 How? Would you mind turning it down? Does it have to...?
Boy 3 Dick ball.
Boy 1 Yo! You just talked into that. Yo!
Boy 2 What he say?
[Whisper then laughter]
Boy 1 Yo, why would? You just...
Boy 2 You know what? I can't. Just forget it
[Laughter]
Boy 1 You are not even t...
Boy 3 Yo, What did you do?
Boy 2 Let me type. I type faster
Boy 3 Come on!
Boy 2 I type faster
Boy 3 Gosh! It would've been over with! Come on! Stop touching the thing.
[Mumbling]
[Laughter]
[Typing and a loud hit of the keyboard as in pressing Enter]
[Singing]

Boy 1 What is Girl 1 doing?
Boy 3 Nothing.
Boy 1 What is she...?
Boy 3 "How to make a wind-generate, generated light bulb?"
Boy 2 "How to power a light bulb?"
Boy 3 That's the same thing!
Boy 2 Oh. Put it! Put it! Put it!
Boy 3 **"**How to make a generated light...?" Oh no.
Boy 2 It's giving you steps. That's not the answer Forget it.
Boy 1 Ah, forget.
Boy 2 I can't watch no more.
Boy 1 Forget it. [Playful]
Boy 3 Video?
Boy 2 Yes. I don't know.
Boy 1 Forget it pax. You know what? It's looking up. Put ankle.
[Playful]
[Laughter]
Boy 2 Put it on YouTube like they do.
[Mouse click]
Boy 3 Let's make it bigger. [This refers to watching the video in full screen mode]
Boy 3 Turn down.
Boy 1 How do you turn it up?
Boy 3 Oh. Right here
[Video playing]
Boy 3 Oh.
Boy 1 No, it was real.
[Video playing]
Boy 3 Oh, let's skip this!
Boy 1 Press this! Press this!
Boy 2 I really want to watch it.
Boy 1 Oh, snap!
Woman You can skip the add.
Boy 1 Oh, you just turn it all the way down.
[Laughter]
[Video sound effects]
Boy 2 What the...? No. Okay, cool.
Boy 3 Paused. [Laughter]
[Laughter]
Boy 3 Oh! It's working. What the...?
Boy 2 What the...? I can't even hear that.
Boy 1 Look at this. Something paused. What the...?
James & Boy 3 Yo!
Boy 2 Yo! I was looking at...Never mind, it's nothing.
Boy 3 Yo!
Boy 2 Hey Yo! That was...
[Mumbling]
Boy 3 What? Yo. What the heck is he plugging the light bulbs in? Yo. Yo. What if you will the light bulb to turn on and make him blind?
[Laughter]

[Singing]

Boy 3 Let me try and do it like this.

Boy 2 Yo. He's gonna miss much of that light bulb.

Boy 3 Oh. Snap.

Boy 1 But how you even -- [crosstalk]

Boy 3 That's nice though.

Boy 1 Oh.

Boy 4 How did he even get the light to power it? You know...

Boy 2 You know what? I can't no more. I can't.

Boy 1 What the?

Boy 3 He's trying to power all of those? Yo! Yo. That can make him...

[Laughter]

Boy 3 Yo. He look like he blind.

[Laughter]

Boy 3 Yo. He looks like he's blind. It paused. That's the problem powers. As in.

[Laughter]

Group Whoa!

[Video playing]

Boy 3 Damn, we mad close.

[Laughter]

Boy 3 Yo, imagine if he blows something up. It be like -- [crosstalk]

Boy 2 Exactly. It might look like... [Blow up sound]

Boy 3 Let's do electrical fails. [Reading the title of a video in YouTube]

[Laughter]

Boy 1 Electrical fails.

Boy 3 Yo. How did the lights shot off? Oh.

[Laughter]

Boy 3 How, how did the lights shot off?

Boy 2 I bet the boy right now is blind.

Boy 3 He says, "Caution".

Boy 2 I bet the man is like this.

[Laughter]

Boy 1 On a scale of one to ten, it will fail.

Boy 3 What is this? Electrical fails? [Mouse click] Can I just make it smaller? [Trying to exit full screen to access other videos]

[Mumbling]

Boy 2 You're supposed to do it Jerry, like...

Boy 3 [Crosstalk] I like it. I'm liking it. I'ma like it.

Boy 2 Your turn.

Boy 1 What the?

Group: Whoa!

Boy 3 I liked it.

Boy 1 Whoa!

Boy 2 Sit down, Moo.

Boy 3 Yo. No one hates it!

[Laughter]

Boy 2 [Singing] I'm a...

Boy 3 Ima put electrical fails.

Woman Does that answer the question?

Boy 3 Oh no.

[Laughter]

Boy 1 That would've been funny.
Boy 2 Exactly.
[Laughter]
Boy 2 The answer would've a surprise. I'll be like, what's up?
Boy 4 It's all right. We haven't got the answer. We are just looking. [Participants read the titles of the video links presented in the screen]
Boy 3 "How to make...?"
Boy 4 "How to power...? How deep is your...?" Yo.
Boy 1 Yo. "How to make five nights at Freddy's not...?"
Boy 2 Yo. "How to make five nights at Freddy's not scary?"
Boy 3 How to save your life?
Boy 4 How you save yours?
Boy 3 How to power off iPhone 6?
[Laughter]
Boy 2 Yo. We already know how to power it off. She got an apple computer.
[Mumbling]
Woman Boy 2, why were you looking at another website. I mean, at another video... It's okay. But why?
Boy 3 Oh.
Woman I just want to know why.
Boy 2 Oh, no. That just says 90...
Boy 1 "How to power a pulverizer?"
Boy 3 "How to power a light bulb?" Oh, no.
Boy 2 Yo. Yo. Let her talk. Let her talk.
Woman Was this useful or it wasn't?
Boy 2 I think it was a little bit useful -- [crosstalk]
Boy 1 It was funny but it wasn't useful...
Boy 4 You have room for one more?
Boy 2 No, we don't. That's it. That's all.
Boy 3 Oh, come on. Go on.
Boy 3 Yo! There is something is wrong!
[Laughter]
Boy 2 Chop, chop.
[Laughter]
Boy 2 No, you did it wrong.
Boy 4 Oh, my gosh.
Boy 3 [Crosstalk] It's not doing it.
Boy 2 I'm like that.
[Mumbling]
Boy 3 Oh, a light bulb.
[Video playing]
Boy 1 Wrong.
Boy 3 Yo. What is this?
[Laughter]
[Coughing]
[Mumbling]
[Waiting for video to start]
Boy 3 Here we go. "Wind power: keeping the lights on".
Boy 4 "Keeping the lights on". "Keeping the lights on". Oh? Keeping the lights on.

Boy 1 All you have to do is your pay the light bill.
[Laughter]
[Coughing]
Boy 3 Bro.
Boy 2 Why don't you get out?
[Mumbling]
[Laughter]
BRIAN: I'm just observing.
[Background conversation]
Boy 2 Oh!
[Video playing in the background]
Boy 3 That don't work.
Boy 4 Brian said, "You know what? I'm gonna screw you".
Boy 2 How do you get out?
Boy 4 Brian said, "You know what? I'm gonna screw your brains".
Boy 3 Yo!
Boy 3 I can't hear it.
[Video playing in the background]
Boy 3 Is it okay if I use this?
Boy 1 What if you light a light bulb and it explodes?
Woman Stop, look and listen
Group: Okay!
Woman You have one more minute
Boy 3 Yo. This ain't showing nothing.
[Boy 3 growls]
Boy 3 Com'on skip. Yo. This ain't showing nothing.
[Boy 3 growls]
Boy 3 This ain't showing nothing.
Boy 1 That's because you ain't...
Boy 2 I got pie and pineapple today.
Boy 2 My mom say, no one's going to have a pie and pineapple today.
Boy 1 That's what James said.
Boy 3 Com'on. Why is it looking like this? It's mad black.
Boy 2 What the? It's not even letting me... You know what? I'm outta here.
Boy 3 Yo, nothing is showing nothing.
Boy 1 What the? Wow! What.
[Video playing in the background]
Boy 3 I don't wanna like this. Yo, Boy 1? Boy 1, I don't like this. I don't like you.
[Laughter]
[Disgusted sounds]
Boy 3 I don't like you.
Boy 2 Yo. Hello! I'm here. I came here to bit your ass. You know what: I'm getting tired of you. I'm getting tired of you.
Boy 3 In a big dick.
[Laughter]
Boy 4 You know what? I'm taking over the TV.
Woman Now, listen. There is a problem with my pencils and the pens. This is the box. You guys get distracted?
Boy 3 Yo! It says, "How to power a lemon". [Reading one of the other video links in YouTube]

Boy 1 What the? What the?
Boy 2 What the? Lemon, oranges. But you said, "Lemon are powered with" -- [crosstalk].
Boy 2 All right, all right.
Boy 3 See it says "How to power a potato". Yo! Yo!
[Laughter]
Boy 2 Wow! Wow! Yo!
[Laughter]
Boy 2 How to power a potato? Those moon shoes, get those moon shoes outta here.
[Laughter]
[Typing]
Boy 3 You know what? I'm going to -- [crosstalk].
[Mumbling]
[Grunting]
Boy 3 Suck a baby in. Suck that baby out.
[Singing]
[Typing fast]
Woman There is a problem with the pencils and the pens...
Boy 2 Really, I wasn't...

Transcript Session 7

Woman 1 I'm just going to record your voices.
Child 1 Okay. [crosstalk] How to power electricity with a potato? [crosstalk]
Child 2 How can I kill this ants?
Child 1 Potatoes... electricity... potatoes.
Child 2 Potatoes.
Child 1 A-O-E-S with electricity. [crosstalk]
Child 2 No.
Child 1 Right there!
Child 2 Potato power! [crosstalk] I just saw potato.
Child 1 No! [crosstalk]. Look at this one! [crosstalk]
Child 2 This? He is dead.
Child 1 Shut up! He reported it. [inaudible][00:01:35]
Child 2 What the what?
Child 1 Exactly.
Child 2 What the... [crosstalk]. No you did all this.
Child 1 I'm so confused.
Child 2 Try couch potato. A couch potato.
Child 1 She's recorded it.
Child 2 Okay. Couch potato is the word. [laughter] [crosstalk]
Woman 2 Hi guys! [crosstalk] Thanks. What did you find? Oh my gosh! Look at that. How did you find this?
Child 1 We went to this website called mini scientist and we played. How...
Woman 2 How did you find that? When you typed in like the question that we [inaudible][00:02:17]
Child 1 Yes.

Child 2 I think how legit a whole power on [crosstalk] I think the guy put the... I think the person puts metal inside the potato and makes the wires touch the metal part. Then electricity will go through the metal.

Child 1 It says, when... couch potato?

Child 2 Insert copper and sit and seal. Then electrodes into the potato close but not touching each other. We use clip light to connect our electrodes to the multi-meter to measure voltage between 2 electrodes or current passing though the multi-meter. For this experiment, we remove the shell of a broken AA battery for...

Child 1 That's mad dangerous.

Child 2 Our sink electrodes. Make sure to test multi-meter by connecting its positive and negative wires to each other that should show no current and no voltage. This is mad dangerous. [crosstalk]. Some liquid is coming out of it. That's very dangerous. It's going to explode. [crosstalk]

Child 1 Woman 1, the mouse doesn't work.

Woman 1 May just change the batteries.

Child 2 If the liquid is coming out of the battery. It's going to explode.

Child 1 Can I say, it's a shell of a great big AA battery.

Child 2 No. It says, for this experiment we removed the shell of a broken AA battery.

Woman 1 Why?

Child 2 Sometimes AA explodes.

Woman 1 You think it explodes?

Child 2 Sometimes no. Sometimes it can explode.

Woman 1 Why? That's so odd?

Child 2 There's a type of liquid inside of it. Something. Then you touch it... if you touch it with metals and the metal is a type of magnet, it has been touch by magnet. The thing will burn some of the battery.

Woman 1 That's so scary. Okay. It's working now.

Child 2 Go type that one.

Child 1 Okay. Let's do this. I'm going to read it.

Child 2 It's super slow. Scooby slow. I guess it's a multi-meter.

Child 1 No. A digital multi-meter show 1.2 volts between the electrodes with the analog. Multi-meter showed a much smaller volume. In other words, even though the voltage between electrodes is 1.2 volts. In other words even though the voltage between electrodes is 1.2 volts

[Laughter]

Child 1 Between the electrodes but the angle. What?

Child 2 We've read that already.

Child 1 Okay. The speed...

Child 2 No. We've read that already.

Child 1 The speed...

Child 2 What?

Child 1 The speed of production of electricity is not high enough...

Child 2 You won't move it up.

Child 1 It's not high enough for an analog multi-meter to show the exact voltage. Analog

multi-meter gives the only asylum. The analog multi-meter gives it's power from our potato to... To show the voltage but digital multi-meter gets...

Woman 1 Stop. Look and listen.

Child 1 Okay!

Woman 1 You have five more minutes before I pass the papers out to write out your findings. Right?

Child 2 We're going to write this.

Child 1 We are making our own words. What row did you lift?

Child 2 Tell him. That's why.

Child 1 Do you have the short?

Child 2 No. I told you, I'm the alpha guy. Not the [inaudible][00:07:49].

Child 1 Debbie! The open before your mother. You could tell the open to call your mother. [crosstalk]

Child 2 I'm not going. You all could play like this. I can play my pants.

Child 1 Do feel. [inaudible][00:08:15] potato?

Child 2 That is why it's so in larger and more accurate volume.

Girl 3 Accurate.

Child 2 That's what I said.

Child 1 That's what... he said. Accurate.

Child 3 Accurate. I can say better than that.

Child 2 Would want me to say like this. Ma, you have accurate.

Child 3 Like say it regularly. The only thing that go up.

Child 2 I know! It's right here. Dame be quiet. We know. Gosh! [inaudible][00:08:57] I stoop I sign off.

Child 1 Okay. Are you going to read this?

Child 2 Blair, I read everything.

Child 1 We connected multiplied the tape of battery. You can make enough energy, electric nodes to light up a...

Child 2 No. Stupid.

Child 1 To light up a super bright light... bright light.

Child 2 Anything. [laughter] Diode including [crosstalk]

Child 1 Okay.

Child 2 You don't know how to read?

Child 1 You know that she's recording it [00:09:44].

Child 2 Guile don't know how to read.

Child 1 She was...

Child 2 Make it like us to be scient -- You all, I want to write. Come on.

Child 1 Will, I don't want to write.

[Laughter]

Child 1 I just want to get [crosstalk]. Connect all.

Child 2 Look, we got it. Is describable [phonetics]. Okay. Let's look at some pictures.

Child 1 Okay. Potato bits.

Child 2 I'm died. Pictures of potatoes. Images.

Child 1 They may have to go back? [crosstalk]. Say something.

Child 3 Potato. Is say something. Potatoes, I like connected because they use like a battery and the light too.

Child 1 She's [inaudible][00:10:40]
Child 3 To like, you know, to... [crosstalk]
Child 2 Wait. Will was right here?
Child 3 Yes.
Child 2 Someone that, who's writing go get the paper. [crosstalk]
Woman 1 We're going to write assignees have them check for those who can write on their own work. [inaudible][00:11:14] who's going to be able to do that. Okay. [inaudible][00:11:18] markers. Part discussing that the papers. One paper... [crosstalk]
Child 4: [inaudible][00:11:31] you're funny.
Child 3 Who's the second funniest?
Child 4: Thyen [phonetics]. Third, gummy. Fourth, idea. Fifth, I don't know. Sixth, victory.
Child 2 Teacher Thalia, we need one more.
Child 1 What? [crosstalk]
Child 3 Who's going to write?
Child 1 Not me.
Child 3 Guys look. Are you going to write? [crosstalk]

Transcript Session 8

[Children chatting throughout]
[Typing sound throughout]
Girl 1 Oh. Why don't we just go to answers dot-com?
Girl 2 Oh, Yeah! I forgot. Friend told us. "Answers..."
[Typing]
Girl 1 You know Friend is not here.
Girl 2 I know.
Girl 1 Oh!
Girl 2 "Dot com..."
Girl 1 Well. You don't need space. You don't need space. "Dot-com" is the other.
Girl 2 You need answers or answer?
Girl 1 "Answers dot com".
[Typing]
Girl 2 "Dot com..."
[Humming]
Girl 1 "Answer's the most trusted place for answering life's..."
Girl 2 I hope it answers our questions.
[Hitting noise]
Girl 2 " How?"
[Typing the question]
Girl 1 Wait... What? Sorry.
Girl 2 "What generates". "G-E-N -- [crosstalk]"
Girl 1 Yeah. "G-E-N -- [crosstalk] E-R-A-T-E-S". More.
Girl 2 --rates. More.
Girl 1 More.
Girl 2 "Electricity"
Girl 1 Wait, wait, wait. Sorry. I don't know how to spell electricity. Girl 3, Can you just do it for me?

Girl 2 "E-I-E..."
Girl 1 Girl 3, she just joined the group. More [Laughter]. You put it in the wrong one.
Girl 3 This looks like an L to me.
Girl 1 Yeah.
Girl 3 I usually do this.
Girl 2 I usually do that, too.
Girl 1 "Elec...tricity" You see? Right there.
[Typing]
Girl 2 "Electricity" "A lemon or a potato"?
Girl 1 It's right here... "A lemon".
Girl 2 "N-O".
Girl 1 Right next to the "P".
Girl 2 "O"... She types so fast, well, to me...No, No "E." OK, I hope it tell us the answer.
[Mouse click]
Girl 1 I need the answers.
Girl 3 That is why it's called answers-dot-com.
[Unintelligible jabbers]
[Sneeze]
Girl 1 God bless you.
Girl 2 Thank you.
Girl 1 I mean, bless you god.
Girl 2 "A lemon". "A lemon" "How does"... okay.
[Scrolling down the webpage using mouse]
Girl 1 I wish that a person who puts a lemon could put how, I mean like "why" is like...[Unintelligible 03:04]
Girl 2 I don't know where I'm going. Can somebody do this for me?
Girl 1 Okay.
[Scrolling down the webpage using mouse]
Girl 1 Three people found this useful. A lemon.
Girl 2 It does. A lemon. Useful?
Girl 1 It is really useful. It does tell us...
Girl 2 It tells us a lemon.
Girl 1 It tells us a lemon. But...
Girl 2 But how? We put...
Girl 1 It was useful but it...
Girl 2 Listen to the question, again and put "why".
Girl 1 Oh! Oh! Yeah!
Girl 2 We just do why.
Girl 1 Okay. Now we just know a lemon.
Girl 2 "Why does a lemon or a potato produce more energy?"
Girl 3 "Why does a lemon or..."
Girl 2 "Why does a lemon or a potato produce..."
Girl 1 No, no, no. No, no, no. "Why..."
Girl 2 "Why does"
Girl 1 "A lemon or a potato"
Girl 2 You will help. Wait a minute.
[Typing]
Girl 1 "Why does a lemon generate more electricity than a potato?"
Girl 2 Or "Why does a lemon or a potato?"
Woman Girl 4.

Girl 1 A lemon?
Girl 2 "A lemon or a potato generate". Wait, can we --
Woman Guys, don't forget the other rule that you can stand up and check what the others are doing, okay?
Girl 1 "Generate. More..."
Girl 3 "Generate more energy..."
Girl 1 No, no, no Electricity.
[Laughter]
Girl 2 Oh, electricity.
Girl 1 Energy [Laughter]
[Typing]
Girl 1 Oh my god! You misspelled electricity.
Girl 2 Oh my God! It's "O", I put "N".
[Clicked Enter key to access links then read the links silently. The TV loading speed was too slow and thus participants had to first figure out that the information was loading up slowly and then that they needed to wait for it]
Girl 3 I don't...
Girl 1 "Generate potatoes".
Girl 3 Watch TV without the TV.
Girl 2 I didn't find anything yet.
Girl 1 [Reading] "Which has more?"
Girl 1 It already went? What? It already went.
Girl 2 I could've just put, um, "Why does a lemon or a potato generate energy".
Girl 1 Oh wait, it's going. No, no, no. It's going... Wait, wait, wait. I see other one. Other thing. Oh. Okay.
Girl 2 Yes.
Girl 1 "Don't see your answers below? So a way to contributing to answers submit. Submit."
Girl 2 Answers had been... Wait. What does submit means?
Girl 1 It's really like. I think submit means like...
Girl 2 Are you sure that's ready?
Girl 3 "One cart opens". That?
Girl 1 Are you sure?
Girl 2 No...
Girl 1 Mmm.
Girl 2 What? Wait! I found the answer.
Girl 1 Where?
Girl 2 Right here. Oh! Oranges?
Girl 1 "The num..." Oh wait. No, that's not it.
Girl 2 Let's go down.
Girl 1 "Lemons because they are bigger and con more citric acid and that makes the light brighter".
Girl 2 Oh! That's our line. Let's go down.
Girl 1 Wait.
Girl 2 Oh. Potatoes or oranges.
Girl 1 "Lemons".
Girl 2 Wait
Girl 1 "Lemons..."
Girl 2 A tomato?

Girl 1 "Probably the lemons because...Because they are most acid. That's why."
Girl 2 Oh. That's our answer.
Girl 1 Oh! Oh!
Girl 2 That's tomato. It's a tomato.
Girl 1 Woman, we found the answer.
Woman Okay.
Girl 3 It says. It says, "Surprisingly, is the lemon. It has more acid, so that's why. The pH thing in it..."
Girl 2 What pH means?
Girl 3 "Go to electricity dot com to seek better answers".
Girl 1 I don't think so. We have the better answer.
Girl 2 Let's try some more. More acid.
Girl 1 Wait, wait, wait. There you have it.
Girl 2 More acid. Acid everywhere.
Girl 1 Yeah, because it has more acid.
Girl 2 "And the potatoes. Potatoes' natural".
Girl 1 Can we get the paper?
[Sigh]
Woman What is the answer?
Girl 3 The answers is because it has...
Girl 2 The lemon has more acid.
Girl 3 The lemon because it has more acid and it makes the light brighter.
Girl 2 Yes. And the potato...
Woman But why? Why the acidity makes it brighter?
Girl 2 The potato is not that bright because it doesn't have acid in it.
Girl 1 It doesn't have as much, as much acid as the lemon.
Girl 3 Because it doesn't have as much acid as the lemon.
Girl 2 Thank you.
Girl 3 "Surprisingly is the acid. It's the lemon because it has more acid. The pH thing"
Girl 2 The pH goes to like somewhat.
Girl 1 What's the pH thing?
Girl 2 Somewhat. It doesn't tell us why.
Girl 1 It doesn't tell us what a pH is.
Girl 2 It doesn't tell us why.
Girl 3 So, we have the first answer. Now we need the second answer.
Girl 1 The second part to answer the question. Yeah!
Girl 2 So keep that in mind.
Girl 1 Okay.
Girl 2 One, two, three...
Woman Let me give you the paper so you can write the answer.
Girl 2 Oh! Right here. Oh my!
Girl 1 I'll write. I'll write.
Girl 5 Did you guys find it?
Girl 1 Okay. So.
[Chatting on the background]
Woman Let me give you all the papers so you can start writing your findings if you have anything. If not, then you don't have to write it.
Girl 2 Part one.

Girl 1 Part one? Oh, we have part one. That's awesome.
Girl 2 You guys know what to write?
Girl 1 No, no, no. Electricity.
Girl 2 Cause, yeah. It has more... When you write it: it has more... because it has generates more... It generates more electricity because it has more acid... than the potato and its pH.
Girl 3 Yeah! That's it.
Girl 2 Because, it has more acid and has pH in it too.
Girl 3 No, we don't know what pH is.
Girl 1 Yeah. So why write it?
Girl 2 I got to use your phone.
Girl 1 No! I don't have a phone like that.
Girl 2 Me, neither. I've never have a phone. Never call me.
Girl 3 It's just a prepaid phone.
Girl 2 Oh! Okay
Girl 3 And. Wait. And pH. Look up what pH is. Go online at "electricity two dot com".
Girl 1 Ah! Okay. So...
Girl 3 "Electricity two dot com".
Girl 1 Wake up! It's your turn to write.
Girl 2 Oh! It's my turn?
Girl 1 Whose phone is this?
Girl 2 Oh! It's Ms N's phone
Girl 1 Ms N's phone...
Girl 1 Okay. Acid. The more acid. Wait, wait, wait. So, how do you think we should answer?
Girl 2 It has more acid than a potato. It has pH.
Girl 1 No, no, no. But we don't know what it means...
Girl 2 If you look up "pH meaning"..."pH stands for..."
Girl 1 But we don't know what pH stands for.
Girl 2 Yes, so we are gonna write "pH stands for".
Girl 1 Okay. The lemon has more... okay.
Girl 2 And has more pH.
Girl 1 No, wait, wait, wait we put pH last.
Girl 2 And then we put, "It has more pH". "pH stands for..."
Girl 1 And then we put "pH" last.
Girl 2 Oh!
Girl 3 Also, the more acid has the brighter the lights. The lights are brighter.
Girl 2 Oh! Okay.
Girl 1 [Writing] The more.
Girl 2 Oh! Like soda lights up.
Girl 1 Soda lights up?
Girl 2 Yes. Soda has acid in it. You didn't know that?
Girl 1 Ewe! I can't believe I drink soda.
Girl 2 It's good. It's sour and a little bubbly coming and stuff. So...
Girl 1 Okay.
Girl 2 And.
Girl 1 The more acid has, the brighter it has...
Girl 2 The more...
Girl 1 Acid it has.
Girl 2 Acid it has.

Girl 1 The brighter it lights.
Girl 2 What, "it has?" Never mind. It doesn't matter.
Girl 1 Yeah, cause they already know it's a lemon.
Girl 2 The brighter what?
Girl 1 The brighter it lights --
Girl 2 Did I spell this right?
Girl 1 There.
Girl 2 I don't do dots anymore.
Girl 1 Really?
Girl 2 Yeah! The brighter...
Girl 1 The brighter it lights.
Girl 3 Yes, it did. You just Google...Oh, oh, oh!
Girl 2 I don't like doing that anymore.
Girl 3 Wait, wait, wait, wait, wait, wait. Where is mine?
Girl 1 Yours is over there.
Girl 3 Wait, wait, wait, wait, wait, wait. I've already put the dot.
Girl 1 Yeah.
Girl 3 The lemon is also brighter because.
Girl 1 Oh! The lemon also lights brighter because it has pH.
Girl 2 I wish I had a picture.
Girl 3 The lemon and potato [crosstalk] generates more...
Girl 1 Generates more...Electricity...
Girl 2 One, two...
Girl 3 Also, the lemon generates more electricity because---Also...
Girl 1 Also, the lemon is...
Girl 3 The lemon generates more.
Girl 1 Electricity.
Girl 3 Electricity.
Girl 2 You sure you should write that?
Girl 1 What?
Girl 2 The lemon generates more electricity because...
Girl 1 Because...
Girl 2 And then also, the lemon.
Girl 1 I also have.
Girl 3 The also lemon. What?
Girl 2 The also lemon?
Girl 1 Also...the lemon
Woman I have a question for you. Why did you guys search what is pH?
Girl 3 Because the lemon has pH in it and that's another reason why it generates more electricity.
Woman Say it again. I'm sorry. I didn't hear you.
Girl 1 Because --
Girl 2 Hydrogen.
Girl 3 Yes, because...
Woman You said that lemon has pH?
Girl 3 Yeah! Because when we researched the question, we have found that the lemon has more and because it has that acid...
Girl 2 pH in it.
Girl 3 It also said, "It even has pH". So we search for pH so that we could, so that we could.
Woman So that you could answer the question?
Girl 3 Ah. Yeah.

Girl 2 pH is a hydrogen?
Girl 1 A what? How do you spell that?
Girl 2 "H"
Girl 3 "O"
Girl 2 H-Y-D-R. Oh you forgot: Y-D-R-O.
Girl 1 Wait H.
Girl 2 Y-D-R-O-G-E-N.
Girl 1 E-?
Girl 2 Yes.
Girl 1 Actually, actually, I didn't know. I didn't know. I just saw that we didn't put this in our own words.
Girl 2 Oh. It tells a lot about pH.
Girl 3 Okay. Let's draw a picture. We need to draw a good one.
Girl 1 Wait, wait, wait, wait. What are you gonna draw?
Girl 3 I'm gonna draw a girl and a lemon.
Girl 1 A girl?
Girl 3 Yes, because the girl is us, you, is us.
Girl 1 Okay.
[Pause]
Girl 1 Actually, I might feel like drawing a lemon.
Girl 3 That's okay. A lemon is just good too.
Girl 1 My turn. Actually, it kind of looks like a potato.
Girl 2 Yes. Is that a lemon?
Girl 1 No!
Girl 2 Oh! So, what is that?
Girl 1 She is drawing a girl. I don't know.
Girl 2 I can't help you but, if you want me to.
Girl 1 Maybe she's drawing a girl to make it less weird.
Girl 2 What's that?
Girl 3 I don't know.
Girl 1 She's blushing.
Girl 2 Looks like she has the brow thing.
Girl 1 Actually, the blushing looks better on her.
[Unintelligible] [10:01]
Woman Guys, don't forget to stay in your own words.
Girl 3 Too bad.
Girl 1 Yeah, we did.
Girl 3 Yeah, we did. I guess.
Girl 2 We wrote a lot!
Girl 1 Actually, I think I better write my part. That's okay.
Girl 2 The potato. I wanna draw a potato.
Girl 1 Okay.
[Pause]
Girl 1 Maybe the potato you can just leave it down there.
[Pause]
Girl 1 Actually, let's get a picture of it. I'm gonna go get a picture of it.
Girl 2 Good job, potato. This will look like a cat. This would look like a cashew. I try my best. This looks like a plant seed.
Kaironi: Okay.
Girl 2 It doesn't matter. As long as the potato...
Girl 1 [singing] I got my drawing...
Girl 2 That's a song?

Girl 1 No. I'm listening to... Really, don't judge my draw.
Girl 2 I'm not. I used to draw like that too. Especially those hands.
Girl 1 I don't mind making one.
Girl 2 Me, neither. Especially the hands.
Girl 1 The hands are the largest...
Girl 2 What's that?
Girl 3 It's supposed to be a lemon.
Girl 2 Oh! Lemon
Girl 1 I love him.
Girl 2 I forgot the...
Girl 1 I remember that in a picture, the lemon it had...
Girl 3 Should the hair be long or short?
Girl 2 It doesn't matter.
Girl 1 Doesn't matter.
Girl 2 Then, draw...

Transcript Session 9

Woman Let me put this here. I am going to audio record you.
Girls Okay.
Woman Let me move this back and I am going to put this here.
Girl 1 So if we did this. We did this separately?
[Typing]
Girl 2 "Why did the Iroquois live in longhouses? Iroquois".
Girl 1 Wait!
Girl 2 Yeah, yeah. "The Iroquois. Lived".
[Typing]
Woman What is your name?
Girl 1 Sophia.
Woman Sophia and...
Girl 2 Girl 2.
Girl 1 "Lived in the, in longhouses..."
Girl 2 "Lived in longhouses".
Girl 1 "Lived in the, in longhouses..."
Girl 2 Oh. "Lived in longhouses".
Girl 1 Yeah.
Girl 2 This is loud and I can't focus. Ok. Let's see what we get.
Girl 1 Okay. "History behind the Iroquois". My mom always says, "Read the great stuff
because sometimes you might not know you might not know, you might not know if this gives you the answer".
Girl 2 So let's just read first...
Girl 1 I do read the great stuff sometimes.
Girl 2 Yeah.
[Quiet]
Girl 1 No, that's not it. [Pause] "Who lives in a longhouse? Longhouses were built and repaired as needed by the men". Let's try this one. "Homes. Homes".
Woman Why did you choose that?
Girl 1 Because in the gray part it said, it said, um "Long houses built and rebuilt".

Girl 2 That looks like a farm.

Girl 1 It's a long house. It's a long house.

[Humming]

Girl 2 "Longhouses were not measured by feet. They were measured by campfires. Although each family had its own assigned place in the longhouse, fire pits ran down the middle of the longhouse for heat and for one to share to use for cooking. A longhouse might be referred to as 10 fires long, or perhaps as 12 fires long. It doesn't sound like much when you count by fires. But longhouses were really long - they could be over 200 feet long".

Girl 1 & Girl 2 "25 feet wide, and 25 feet high. That's huge! To get an idea of how big they were, measure the distance from floor to ceiling in your own house".

Woman I'm sorry, why did you choose this site again?

Girl 1 We chose this website because, because it said, "Homes longhouses" and it said, "It's built and rebuilt by men" and it did. So, I said "Choose this one, it might give us the answer".

Woman Okay. Let's see.

Girl 2 "First, the men cleared the land. Nothing was wasted. Twigs and trees alike were used in many ways. Once the land was cleared, the men made a frame out of long".

Girl 1 & Girl 2 "...poles of wood. Then, they tied young trees to the frame, trees young enough to bend and shape. Once they had the shape of the longhouse in place, they".

Girl 1 "...covered ".

Girl 1 & Girl 2 "...the house with bark".

Girl 1 "...They added a few smoke holes".

Girl 1 & Girl 2 "...and two doors - one at each end. The Iroquois rigged a flap on the smoke holes. When it snowed or rained, the holes could be opened or closed as needed".

Girl 1 "Later, the people might go back and add [omitted to] the longhouse"

Girl 2 "The natives built longhouses because they...Many longhouses had a huge pole fence built around them for additional protection."

Girl 1 "Stairs were built on the inside of the fence, so that archers could easily climb up and defend against attacks. The poles and long sharp points to discourage anyone from climbing over." So, it's mostly like a defence place for if they are under attach the archers can climb up easily and defend against any attacks.

Girl 2 "...and a huge fence, the pole fence was used for additional protection".

Girl 1 That sounds interesting, but...

Girl 2 So now we know why they built, we need to know how.

Girl 1 It said how.

Girl 2 Wait. Yeah!

Girl 1 It said how, so we got our answers.

Girl 2 Great. Um.

Girl 1 It says. Wait. Go down. It says...

Girl 2 Here

Girl 1 From...Here

Girl 2 Here. Here. How did they put it?

Girl 1	Yeah.
Girl 2	"First, the men cleared the land. Nothing was wasted. Twigs and trees alike were used in many ways."
Girl 1 & Girl 2	"Once the land was cleared, the men made a frame out of long poles of wood. Then, they tied young trees to the frame, trees young enough to bend and shape. Once they had the shape of the longhouse in place, they covered the house with bark. They added a few smoke holes and..."
Girl 1	"...two doors - one at each end."
Girl 1 & Girl 2	"The Iroquois rigged a flap on the smoke holes. When it snowed or rained, the holes could be opened and closed as needed."
Girl 2	"Later" -- [crosstalk].
Girl 1	No, no, no! That's it. That's it. That's how, that's how they built it [Laughter]. So that's what they know, that's what they needed from the fences at the bottom from here.
Girl 1 & Girl 2	From here.
Girl 2	Here, here, here.
Girl 1	Here.
Girl 2	To here.
Girl 1	Yeah. So, from these two places.
Girl 2	And then down here.
Girl 1 & Girl 2	Is why...
Girl 2	They.
Girl 1	Why! "Why the Iroquois lived in a longhouse?" So we mostly have our answer.
Girl 2	But let's see if there is better answers.
Girl 1	In a better place.
Girl 2	But if not, let's go back on this one and say [Inaudible] [06:43].
Girl 1	So I read this.
Girl 1 & Girl 2	[Reading] [Inaudible] [06:49].
Girl 2	No, that doesn't say anything
Girl 1	Yeah, that doesn't say anything. "The longhouses of the Iroquois used by the Native American Tribes and some of the Aloquian".
Girl 2	"Alagoquian".
Girl 1 & Girl 2	"Alagian, Alagolquian, Alagonquian".
Girl 1	I say whatever. "Natives. They were going hunting trips but did not invite them into the same longhouse for their lives". They did not have any walls. "But" -- [crosstalk].
Girl 2	No answer.
Girl 1	No answer.
Girl 2	"Why did the Iroquois live in longhouses?"
Girl 1	That was what we just put in!
Girl 2	Oh wow!
Girl 1	It answers both of the answers: "Why did the Iroquois live in longhouses and how did the Iroquois live in longhouses?"
Girl 2	So we looked up why.
Girl 1	And...
Girl 2	So now let's see how.
Girl 1	And they give... Wait. Go back up. This gives us both of our answers because it says why and how. So mostly "Homes Longhouses Native Americans in the olden times for".
Girl 2	Okay. So, lets look how.

Girl 1	Yeah.
Girl 2	But if it doesn't have it, then we do something with why.
Girl 1	Houses. See exactly it is.
Woman	What's going on?
Girl 1	We clicked in "Why" and then when we clicked in "How the Iroquois build the longhouse we saw the same website. Because this website" -- [crosstalk].
Woman	Oh! That's funny. I wonder why?
Girl 1	Because it answers both questions "Why" and "How".
Woman	Say it again?
Girl 1	They give -- [crosstalk].
Girl 2	It answers the questions: the "How and why the Iroquois build the longhouse and" -- [crosstalk].
Girl 1	That's why we saw both of them.
Woman	Interesting.
Girl 2	Try "Indians dot com".
Girl 1	This must be interesting.
Girl 2	"Indians".
Girl 1	That's what Iroquois are: Indians. "Iroquois Indians were." [Pause] "Indian, Indian tribe was actually a confederacy of six nations. American nations" Sorry. "It was considered of the Mohawk, An-de-g..."
Girl 2	"Wan... Waniga".
Girl 1 & Girl 2	"Onedada. Kaliba. Seneca and Tus..."
Girl 2	"Tusc... Tuscada".
Girl 1	"Very powerful."
Girl 1 & Girl 2	And.
Girl 2	That it isn't just answering the question.
Girl 1	Yeah, this just gives information about.
Girl 2	History.
Girl 1	About the Indian Iroquois. So mostly our answer is in, is in a...
Girl 2	The home website.
Girl 1	Yes, "Homes longhouse and Americans in olden times".
Girl 2	Yes.
Girl 1	So our answer is in "Homes in longhouse". So we remember the place. From... We are on a different website.
Girl 2	I think we are the only group that found the answer.
Girl 1	One, two, three, four, five, six. From six.
Girl 2	Six, eight, nine, ten.
Girl 1 & Girl 2	From six to ten. From ten to, ten, twelve.
Girl 2	Twelve!
Girl 1	Ten to twelve.
Girl 2	So six to twelve.
Girl 1	Six to twelve. That gives us the answer if you go to, "Homes longhouse Native Americans and olden..." from something, something.
Girl 2	"Longhouses, Native Americans and olden times for kids". Wow.
Girl 1	Wow. It gives you the straight answers as the why and how.
Girl 2	And everyone thought Wikipedia had the answer for everything.
Girl 1	Sometimes Wikipedia has the answers.
Girl 2	But too many but too many big words, we can't understand it.

Girl 1 Yeah, that's why they, that's why we went, that's why I chose "My home, my home's longhouse info America and olden times for kids". This is my first different website. My first different website instead of Wikipedia... That I chose. Six kids all.

[Chatting on the background]

Girl 1 We have the answer and everybody else is gonna try. "First the men tied long things".

Girl 2 Wait, wait. Don't copy it. We have to say it in our own words.

Girl 1 Yes, that's what I'm trying to do. "First the men clear the land, nothing was wasted".

Girl 2 So, that's answering why [Inaudible] [12:41].

Girl 1 Yeah, so please draw here.

Woman Stop, look and listen.

Group Okay.

Woman You are getting a little too loud. Okay? Continue.

Girl 2 Maybe...

Girl 1 "Houses had huge pole fence built around the for additional pro protection. Stairs were built on the inside of the fence, so" -- [crosstalk].

Girl 2 You just have to write, "The Iroquois built longhouses for protection".

Girl 1 Yeah, so that makes it shorter!

Girl 2 Yeah.

Girl 1 But they gonna asks us why! But we already have it.

Girl 2 Yeah.

Woman So, can you fill her in?

Girl 1 Sure! Are you on our group or not? Okay

Girl 2 So, the question is "Why did the Iroquois live in longhouses?" And "How did Iroquois build longhouses?"

Woman How do you spell your name?

Girl 3 [Girl 3 says and spells name]

Girl 1 Ten. You know the 10 words that Ms. B gives us? The sentence.

Girl 2 What sentences?

Girl 1 Okay. "Iroquois". It says it like this, where we can break it down into a sentence that has 10 words or 10 letters. That's what Ms. B says. So we can put ten different words inside of one sentence so that way we can make a sentence!

Child 3 "The Iroquois, the Iroquois..."

Girl 1, Girl 2, **Child 3** "Built longhouses..."

Child 3 Wait, wait, no, no...

Girl 2 & **Child 3** "The Iroquois lived in long houses because they were used for protection"

Girl 2 "Protective".

Girl 1 Yeah, that's right.

[Background chatting]

Girl 2 "P-R-O-C. P-R-O-C".

Girl 1 "P-R-O-C?"

Girl 2 Yeah! Then "T".

Woman You guys have ten more minutes.

Girl 1 Now that we answer why, now we have to get the how. The how is kinda of big.

Girl 2 Excuse me. "The Iroquois built longhouses with wood, trees, with wood and trees".

Girl 1 So, "The longhouses were mostly built by wood and trees". Then we can draw more houses. My turn. I said "Mostly". I said, "Mostly built! Mostly Built! Mostly Built!" That's okay.

Girl 2 The trees, the trees.

Girl 3 Whose phone is this?

Girl 2 That's hers.

Girl 3 Whose?

Girl 2 Ms. W's. Don't touch it! No, No.

[Laughter]

[Playing with iPhone]

Girl 3 Turn it off.

Girl 2 How you turn it off.

Girl 3 It's a iPhone.

Girl 2 Yeah... First. First.

Girl 1 First. First the man cleared the land.

Girl 2 You can turn anything into a song.

Girl 1 First the man cleared the land.

[Singing]

Girl 1 Nothing was wasted.

Girl 2 No, don't write that one.

Girl 1 And then nothing was wasted.

Girl 2 No! That's not important.

Girl 1 Yes, it is! Nothing was wasted.

Girl 2 That's not important.

Girl 1 That's how you make fire! How are you gonna make fire? How are they supposed to cook? The fire! Write nothing gets wasted.

Girl 3 Shhh! Okay.

[Laughter]

Girl 2 "Then, they tied".

Girl 1 "They tied young trees".

Girl 2 "Tied young trees".

Girl 1 No, "They tied young trees".

Girl 2 "Young trees".

Girl 1 "To the frame".

Girl 2 "To the frame".

[Inaudible][18:51]

Girl 2 Nooo! "They tied young trees together to get the shape of the longhouse". That's exactly how it is.

Girl 1 Yeah.

Girl 3 "Shape them all. To get the shape of..."

Girl 2 "To get the shape".

Girl 2& Girl 3 "Of the long".

Girl 2 "Longhouse". What the heck?

Girl: Sorry, it was an accident.

Girl 2 Oh longhouses. Yeah.

[Inaudible] [20:10]

Woman Stop, look and listen.

Group Okay.

Woman Hands up! If you think this is just to sit down and relax, you can go back to your classroom. When you do your presentations I am

going to see who did what work and who answered the big question. Keep going.

Girl 2 What? What?

Girl 1 The smoke holes.

Girl 2 "The Iroquois" um...

Girl 1 "Rigged! R-I-G-G-E-D".

Girl 2 I know!

Girl 1 "They planted a flag on".

Girl 2 Flag? flag or flat?

Girl 1 "Flat..." I didn't mean "Flag". I meant "Flag". That's humongous. Not good.

[Inaudible] [21:24]

Girl 2 "Rain or snow".

Girl 1 Rain or snow. It doesn't matter!

Girl 2 Oh! Rain or snow.

Girl 3 After smoke holes there is a "period".

Girl 2 It doesn't matter.

Girl 3 Yes, it does!

Girl 2& Girl 2 No, it doesn't!

Girl 3 Yes, it does!

Girl 1 & Girl 1 [Yelling] No, it doesn't!

Girl 3 Yes, it does!

Girl 1 It might rain before it snows, or it might snow before it rains.

Girl 1 Okay. You get the pictures up. I get the markers ready.

[Loudspeaker announcement]

Girl 1 I like the way you write your name.

Girl 3 Thank you.

Girl 1 All we need is just Girl 2.

Girl 2 Yeah.

[Inaudible] [22:43]

Girl 1 Right here, yeah, rigged.

Girl 3 Right here: Rigged. What does rigged mean?

Girl 1 It means look!

Girl 2 Say it again.

Girl 3 "Assembling".

Girl 2 "Assemble. Adjust".

Girl 2 Wait, say it again.

Girl 3 "To make it".

Girl 1 & Girl 2 "To make ready for".

Girl 2 "Sailing by providing it with sails and rig, rigging".

Girl 1 That's what rig means.

Girl 3 "To make it ready for". No. Where is it?

[Inaudible] [23:17]

Girl 1 Girl 2, write "Rig".

Girl 3 I write it.

Girl 2 "Rig: to put in proper order for working or use".

Girl 2& Girl 1 Okay. So...

Girl 2 Now. Hold on. Hold on.

Girl 1 Wait. What's the picture we are gonna be looking for now? But wait, wait, we are not even done with it.

Girl 2 "Rig".

Girl 1 What did you do?

[Laughter]

Girl 1 Oh, my God! I hope it's okay. Look it. Look it. Leave it. Leave it! Don't touch it. Don't touch it!

Girl 3 So put in. "Rig: order for working or use". Yeah.

[Background chatting]

Girl 1 We are missing the word "Order".

Transcript Session 10

[Children talking throughout]

Boy 1 I was writing, so.

Boy 2 "Avoid frostbite aaaand hapo-therma [phonetic].

Boy 1 Just be quiet!

Boy 2 Oh yeah!

Girl 1 And hypothermia.

Boy 2 Oh no. Three hundred, three hundred, three hundred.

Boy 1 No!

Boy 2 Oh, it's right here!

Girl 1 And "hypothermia".

Boy 1 It's right here! Jez.

Girl 2 "How the Iroquois did?"

Boy 1 I don't care.

[Typing]

[Inaudible chatting]

Girl 2 "Frostbite and hypothermia" [Pause]. And "hypothermia!"

[Keyboard fast clicking of one key]

Boy 2 [Singing] That's what I tried to say, so yez.

Girl 2 "What is frostbite?" Why would you put that?

Girl 1 We know.

Girl 2 Oh, where is a marker.

Boy 2 Jo.

Boy 1 Jo, this is what frostbite is. That's what frostbite looks like. Jo, look at that!

Boy 2 That's disgusting.

Boy 1 That's frostbite. Jo. Look. Yo, Boy 4.

Girl 1 Look at Boy 4.

Boy 2 Boy 4! Boy 4! It's frostbite.

Boy 1 This is what frostbite means: "Injury to body tissues" Be quiet!

Girl 1 No!

Boy 1 "Caused by exposure to ethical [phonetic] topical"

Girl 2 "Extreme!"

Boy 1 I said that.

Girl 2 Boy 1, you should it look for images of frostbite. What?

Girl 1 Let me see. Jo, put it in images again.

Girl 2 Cause look.

Woman Put it. Oh, no, no, no. Never mind.

Girl 2 See that's frostbite.

Boy 2 This too.

Boy 1 No that's a. No that's the real.

Boy 2 This is real frostbite.

Boy 1 No, this is, this is real frostbite. That. See cause.
Girl 1 It's already freezing.
Boy 1 Yeah, it's already frozen. He can't even open his eyes.
Boy 2 Go!!! Jo!!! He is getting mad green. Look at this! Ewe!
Boy 1 That's frostbite! That's is frostbite!
Boy 2 I want Boy 4 to be in our group.
Girl 1 [Singing] Look at that big hand.
Girl 2 There is nothing wrong with that hand right there. It's a hand
Boy 2 Yeah, what's wrong with that hand?
[Laughing]
Boy 2 It's a Boy 4's hand
[Inaudible chatting]
Boy 3 Oh yeah! She didn't come today.
Boy 1 No one likes you.
[Paused for a few seconds]
Boy 1 What is frostbite means?
[Typing]
Girl 1 [Whispering] Jo-ho, jo-ho.
[Typing]
Girl 1 I'm screwed.
Girl 2 They giving... [Whispering].
[Passing gas noise made with mouth by student]
Girl 1 Jo! She said she is --[Inaudible].
[Inaudible chatting]
Woman How do you spell your name?
Girl 1 Girl 2, Girl 2. [Girl 2 spells name].
Girl 2 A. [Girl 2 spells name]
Girl 2 [A gilr] is creeping on Lawrence of um, um, um and [A boy].
Girl 1 Jo, she said "Um, um, um".
[Girl 1 making noises]
Boy 2 That's so annoying! And.
Girl 1 Jo, she was starring at them. She went creeping on them.
Boy 1 Who?
Girl 2 Joy, she went to see Lawrence and um, um, um, um, um, Terrell's computer. She went creeping on them.
Girl 1 Because she likes them.
Girl 2 Yes! But she was not breathing.
Boy 2 How, like this?
Girl 1 My god! You are not typing in the right stuff!
Boy 1 Yes, I am.
Girl 1 No, you are not.
Boy 1 Ease bro.
[Mouse clicking sound]
Woman Why did you choose that website?
Boy 1 Cause I wanna see what information was on that.
Boy 2 Yeah.
Boy 1 It says, "Not able to download". See. That's why I didn't pick that one. Thank you. They can leave.
Boy 2 Come on Jo. Come right here.
Girl 1 Is that fake or something?
Boy 2 Are you a fake?
Boy 1 No! You left.

Girl 1 Excuse me!
Girl 2 Excuse us!
Boy 1 No! You left!
Boy 2 No, cause you guys left already.
Boy 1 You wasn't doing anything! Told you. Told you. You guys wasn't doing anything! Let's just go back, cause I want to see something on that.
[Pause]
Boy 1 It says...um -- "It was a..."
Boy 2 Is that moisture?
Boy 1 Oh my gosh!
Boy 2 What is: someone is gonna download it?
Boy 1 You know what? I'm gonna say it in my own words. I say it in my own words.
Boy 2 What is...? Oh no! I got it. What is?
Woman So, you're changing the wording of the question?
[Kids asking and talking]
Boy 1 Yeah.
Woman Why?
Boy 2 "What is?" Um. "What is?"
Boy 1 Cause is nothing, is nothing, staring up with this question.
Boy 2 Oh, I know. I got it. I got it.
Boy 1 I'm thinking that we may use another, another wording.
Boy 2 Okay! "What is frostbite?"
[Typing]
[Woman giving instructions]
Boy 2 "What is hypothermia?"
Boy 1 Hold up!
Boy 2 Oh no! Right here.
Boy 1 "How did the Iroquois avoid?"
Boy 2 I'm saying it in my freaking own words!
Boy 1 "What did the Iroquois avoided frostbite?"
Boy 2 Wait, what? That question wasn't…No, No.
Boy 1 It says, "Why did the Iroquois avoided frostbite and hypothermia?
Boy 2 No, No.
Boy 1 Oh! How? "How did the Iroquois…?" I thought... I said, "Why did the Iroquois…"
Boy 2 Avoid frostbite and hypotherma [phonetic].
Boy 1 I'm a put… What?
Boy 2 "Read the tech review. Read the tech review..." [phonetic] grrr…
Boy 1 "You're using an older verBoy 4 of Chrome". An older version 4. That's why. "Why did the Iroquois avoid..."
Boy 2 Hunt buffalo?
Boy 1 "Did the Iroquois avoid frostbite?"
[Typing sound]
Boy 2 What the what?
Boy 1 Cause I wanna know did they!
Boy 2 Yeah. I wanna know that too. What about this one here? Okay so, this is "The University of Illinois and champion...." Okay we got "What is frostbite?" "Frostbite is the freezing skin and or other

issue" I mean, "Or other tissues under the skin. A person with frostbite under extreme tires?"

Boy 1 I'm gonna get a paper.

Boy 2 All right. I'll keep on reading! "Would also be subject to hypothermia; lowered body temperature". What?!

[Boy shouting]

Boy 1 Red and blue. Yes, red and blue.

Boy 2 Oh, yeah. I'll keep on searching. Well, okay. "What is frostbite?" is not this because it doesn't say anything

Woman Stop, look and listen! Because today we started so late then we're not going to have time to take notes but we're going to' continue with this same question tomorrow. Okay? We started very late and we only had liked a 15 minutes to solve this. So, we're going to continue tomorrow. Put everything back. We're not writing today. Okay?

Boy 2 We should just put our names on here.

Woman No because we're going to' give you a paper, remember that I said that?

Boy 2 It's the second one. "...It's the freezing of the skin"

Woman Why did you choose this one?

Boy 1 We chose this one because we wanted to learn "What is frostbite?" and [crosstalk] and the skin [mumbling]

Woman You know what, go to your group. So you actually know what is frostbite, because you've been [inaudible] [10:54]. So go back and type the rest of the question. Go! Go back to...[inaudible][11:01].

Boy 2 Sound cloud?

Boy 1 No, it's a…[Inaudible] [11:40].

Boy 2 I think you should take it from here.

Boy 1 I know.

Boy 2 Look at what they did to your keyboard. They wrote on the keyboard.

Boy 1 They wrote on letter "G".

Boy 2 I guess the pre-kers did that.

Boy 1 Probably.

Boy 2 Yes, probably no.

Boy 1 [Singing] Wikipedia. Wikipedia. Wikipedia.

Boy 2 You're so annoying.

Boy 1 What? See. It's the Iroquois,

Boy 2 It's not Money! It's not money? Isn't that money?

Boy 1 This is the Iroquois. That's the Iroquois longhouse. This the...

Boy 2 The Haudenoshwnee.

Boy 1 Yeah.

Boy 2 Oh, look. Money!

Boy 2 Do you think that's what they ate?

Girl 1 No!

Boy 2 Do you think that's what they ate? Cause, I think that's what they ate. Um. It kind of looks like something…

Boy 1 What the? Oh men! What is he doing? He's trying to get hit by a train

Boy 2 Yes. Oh! The Chinese USA army.

Boy 2 Oh look! The Native Americans.

Boy 1 That's the Native Americans.
Boy 2 Jo. One dollar.
Boy 1 News.
Boy 2 What about videos?
Boy 1 Neigh.
Boy 2 Tuesday with in the court room.
Boy 1 News.
Boy 2 It's all about...
Boy 1 "Stay up-to-date".
Boy 2 "Create alert".
Boy 1 News.
Boy 2 It's all about football videos, yes or no?
Boy 1 Let's see. What the?
Boy 2 We're done already. [Giggling] You might be late. Just like Michelle from yesterday
Boy 1 Exactly!
Boy 2 Jo. Jo. He came in at the end of the day.
Boy 1 I'm looking up avoiding frostbite.
Boy 2 Voiding and treating!
Boy 1 See! Oh men!
Boy 2 Jo. Who was? Would like to go to a Facebook, Twitter, Instagram and search and find this? Look.
Boy 1 That's the pictures. You gotta take pictures.
Boy 2 Is not looking good.
Boy 1 "How do I know if I have frostbites?"
Woman Boy 1. Why did you click on that link?
Boy 1 Because it said, "Avoiding and treating frostbite" and I want to know how to avoid frostbite and how... What are the symptoms?
Woman Why did you want to know that?
Boy 1 Cause, I want to see like more what will happen if I get frostbite? Will I die or will I just have to deal with it? And I wanna see, see how will I have frostbite to the signs of it?
Woman Okay? Does the signs helps you answer the question?
Boy 2 And the signs.
Boy 1 Yes!
Boy 2 Um...
Boy 1 Cause it says, "How did the Iroquois avoid frostbites?"
Boy 2 And hapotherma.
Boy 1 And this is a website about how avoiding frostbites.
Boy 2 Oh, no. Hapothermia kills
Woman Okay. How is that helping you?
[Children shouting]
Boy 1 Like, is, the question is "How the Iroquois avoided frostbites?" and this website is about frostbites, and I like, it's the questions says, "How did the Iroquois avoid frostbites?" This website is about avoiding frostbites. So, I wanted to see how would they avoid frostbites.
Boy 2 So, so. We are gonna go to this one.
Boy 1 Yeah. How do? How do? No! That's, "How do I know I have frostbites?" That's it.
Boy 2 What about the hypothermia?

Boy 1 It doesn't even say how, how, how to avoid frostbites. It'll probably say all the way up here.
Boy 2 "Go hiking. Find a park. All about us. Our community".
[crosstalk] --
Boy 1 Let's see another website.
[Girl humming]
Girl 3 Jo. What? Why are they watching the news?
Boy 1 Because it's about frostbites.
Boy 2 "Videos. Videos..."
Boy 4 Oh! Did you all put in your own words?
Boy 1 No. Cause...
Boy 2 No. "How did the...?"
Boy 4 "How did the Iroquois…?"
David Cause that's the same thing that they are watching.
Boy 1 I know! But I wanted to say it in my own words. [Crosstalk]
Boy 2 Oh! "Avoiding hypothermia!"
Boy 1 "Time Warner Cable".
[Boy making sounds]
Boy 4 I wanted to come late again.
Boy 1 Jo. It sucks. Stop it, stop it, stop it
Woman Why do you click on that one?
Boy 1 Cause, we wanted to see what, what forecast or whether came. Or what weather would it be it to get frostbite. Like if, Like, if it is the same.
Woman Oh!
Boy 1 Like, if they're like the same…
Boy 2 Oh. No, no, no. Stop! On "Top stories, trending news, video of the day about frostbites…"
Boy 1 Jo. Like, theirs is fine.
Boy 4 Can I come in? Yes, so, would you guys be zip your lips?
Boy 2 You guys are like the funniest one in school.
Boy 4 Zip your lips?
Boy 1 What? You know what? You are not...
Boy 1 We should look up YouTube to see what forecast would it be for you to get [crosstalk] frostbite.
Boy 2 YouTube group. YouTube group.
Boy 1 "For you to get... For you to get..."
Boy 2 "To get frostbite".
Boy 1 Yeah.
Boy 2 "Introducing…" [Crosstalk].
Boy 4 He said, "Frostback". He said, "Frostback"
Boy 2 No.
Boy 4 You said, "Frostback".
[Laughter]
Boy 1 No, I didn't said "Frostbite".

Transcript Session 11

[Children talking throughout]
[Laughter]

Boy 1 See? Don't say anything curses cause right now she is recording our voices.

Boy 2 Cheese ball.

Woman So, what's the question?

Girl 1 The question is...

Boy 2 How did the animals "influence" the Iroquois clothing and "Wapon" "Weapon?"

Boy 1 "Weaponary".

Boy 2 "Weaponery!"

Boy 1 No, what's wrong with you? This is the question...[Crosstalk]

Boy 3 "Weaponery!"

Boy 1 What is the future of learning? [Screaming].

Boy 3 "Weaponery!"

Boy 2 No. It's "Weaponry", not "Weaponary..." "Weaponary..." [Laughter].

Boy 1 Yes, it is "Weaponary"

Girl 2 There is not "A" Jo, there is no "A".

Boy 2 No, it's "Weaponry. Weaponry!"

Girl 2 Yes, it's weaponry.

Boy 1 What is it called?

Boy 2 "Weaponry".

Boy 1 "Weapon".

Boy 3 "Weaponwood".

Boy 1 "Weaponra. Weaponra".

Boy 2 "Weaponry".

Boy 1 It's "Weapon. Weaponary"

Woman No.

[Laughter]

Boy 3 "Weaponary". "Weaponary".

[Typing]

Boy 1 Huh?

Girl 1 Where is the stupid "Q"? Where is the stupid "Q"?

[Laughter]

Boy 3 No, it's a "Q". It's a "Q" instead of the "T".

Girl 1 I know but where is the stupid "Q"? [Pause]

Boy 3 Oh!

[Laughter]

Girl: I've been missing a "Q" too.

Boy 3 Wait you, guys. I think is better if we can like...[Crosstalk].

[Laughter]

Boy 2 You can't eat all the candy bro.

[Laughter]

Boy 1 That's on my pocket.

Boy 3 I think that it's better if we watch a video though, cause...[Crosstalk].

Boy 1 Stop.

Boy 3 It will be better and we would be able to learn more...

Boy 1 Hey, phony.

Boy 3 Jo. He called it phony.

[Laughter]

Boy 1 Okay. I can just do it like this. Hey, phony. Phony Tony.

Boy 3 Oh, do, do the videos. It might help us some more.

Girl 1 Yeah, it might help us.
[Boy 1 singing]
Boy 1 Stop it. [Boy 1 singing]
Girl 1 I'm trying to...[Crosstalk]
Boy 2 He's kind of like this.
[Laughter]
Boy 1 No, you actually going to do like Robin hood.
Woman Why do you choose that one?
[Boy heckling]
Girl 1 Because I think electricity dot com will give me more information.
Woman It will give you more information?
[Laughter]
Girl 1 Aha.
Woman Okay. Do your thing.
[Boy heckling]
Boy 2 What are you guys doing?
Boy 3 Stop!
Woman Nothing. That's it.
[Laughter] [Whistling]
Girl 1 Stop!
Boy 3 Stop!
Boy 1 What am I doing?
Boy 2 He is over here like [Imitates Boy 1's sounds].
[Laughter]
Boy 2 Facts for kids. We are kids, right?
[Coughing]
Boy 1 I'm not doing anything.
Boy 2 American facts for kids.
Boy 1 It's native. Native Amer...
Boy 2 Maybe they take a feather and turn it into like a mini-sword?
Boy 3 Why [crosstalk] would it turn into a mini-sword?
Girl 2 "Mohawk, Seneca, Oneida, Onondaga, Cayuga".
Boy 2 Or maybe, or maybe they take boats and break them and take the parts and use them as weapons.
Boy 1 She said Tesoro.
Boy 3 Jo, that's not even right. That's not even right.
Girl 2 How did you even say that. "Taskuora" [Mispronunciation].
Girl 1 I'm trying to find Wikipedia. Let's go to images, guys. Let's go to images, guys. [Crosstalk].
Boy 1 It's "Tueskimo" [phonetics]. It's "Tueskimo" [Crosstalk].
Boy 2 Maybe they break the bones out of animals.
Boy 1 Oh, it's "Tueskimo"? [Crosstalk].
Boy 3 Maybe they use tusks.
Boy 2 And like cut them into sharp...
Girl 2 That's amazing. What the...?
[Coughing]
Boy 1 That's a beaver. A beaver is a Native American.
Boy 3 What the...?
Boy 2 A beaver is a Native American?
Boy 3 Jo. That makes no sense.

Boy 1 That's what they [crosstalk] Native Americans. I said, "What the hell...?"

Boy 3 What the hell is that?

[Laughter]

Boy 2 Jo.

Girl 1 Why would you say that?

Boy 3 What the...?

Girl 1 She's recording.

Boy 3 She's not even recording.

Boy 1 Yes, she is. So, she is...

Boy 2 Jo. They used the horns... [Pause] I wish I could steal this suit. I will be like this. Bull man. [Pause]. Jo. Look at the sword, Jo.

Boy 1 &
Boy 2 Wow!

Boy 2 Jo. Did you just see the bull down there?

[Coughing]

Boy 1 Go down, Janiya, go down!

Boy 3 You just...

[Mumbling]

Boy 2 What are you doing? Whoa! Go down.

Boy 3 That's nasty stuff.

Boy 1 What the heck?

Boy 3 What is that?

Boy 1 That's one bull that...

Boy 3 That's one bull that...

Boy 1 Janiya, can you let me count the bull?

Girl 1 That's a two.

Boy 1 No, there's three. It's a baby bull down there.

Boy 2 Oh, maybe it will take a, a wooden, a wooden stick, right? They'll take the ribs out of the animal like this until they're stuck in there and use it just like a fork and be like, "What do you want? What do you want?

Girl 1 Stop it!

Boy 2 And you take the fire things. "Where do you put the money?"

[Mumbling]

Boy 2 It's the state police. Open up.

Boy 1 "Wapicome".

Girl 1 "Wapicome".

[Laughter]

Boy 1 I said, "Wapicome "

Boy 2 "Wikipedia". Wait, wait. "Wiki. Wikipedia".

Boy 3 "Wikipedia"

Boy 1 It's "Weaponary" Why did they put, weapon, heho?

Jamire: Weaponsss, wiki. Weaponswiki. Weaponswiki.

Boy 1 What the heck?

Boy 2 Boy 1 is being a cheese bus.

[Murmuring]

[Coughing]

Girl 1 Same as you.

Boy 3 That's nasty.

Boy 1 Cheese bucket right for you in the bus?

Boy 3 Why is he obsessed with cheese? [Crosstalk]

Girl 1 ...science?
Boy 3 Why are you obsessed with cheese? [Crosstalk]
Woman Girl 1, what website did you choose?
Girl 1 I picked Wikipedia.
Woman Why?
Girl 1 Because, it shows you all the pictures and it like might give you half of the answer
Boy 1 Where? Where? Squad!
[Murmuring]
Girl 1 What is squad means?
Boy 1 Instead of saying squad in that song, he be like this: "Squaaad"!
Boy 2 All right. "The economy..." [Crosstalk]
Girl 1 No! You can say this, "Also known as Haudenosaunee" [Crosstalk].
Boy 2 "Of the Iroquois also known and Hinassawnee... [Crosstalk].
Girl 1 You know that?
Boy 2 "Historically was based on production and combined with elements of both... something in hunter gathers systems".
Boy 3 What you doing? You keep switching. Leave it up!
Girl 2 What?
Boy 3 Leave it up!
Girl 1 Where Boy 1 go?
Girl 2 I don't know.
[Background Conversation]
Girl 1 Come on Girl 2, stop!
Girl 2 No, she keep on moving on me. I'm not whining every time all the time, every time someone does something to me**.**
Girl 1 You squishing me.
Girl 2 Sorry. Just say something nicer instead.
Boy 3 I'm gonna go and see around. I'm gonna go look around. I'm gonna look around and see if we can learn from each other.
Boy 2 Don't be clicking on the words
Girl 2 I'm not
Girl 1 "If we all give three dollars to fundraising..."
Boy 2 Let's try "How did animals help make..."
Girl 1 What the heck is this? This is... [Crosstalk].
Boy 2 Let's try, how did animals help make, um, weapons? Or something. No, Iroquois weapons
Boy 4 "Give a hundred dollars". I did. Just kidding
Girl 2 Weaponry.
Boy 4 No. Give, give $5,000.
Boy 3 I just read on something called "Iroquois Nation".
Boy 2 All right. Let's try, "How did animals helps make Iroquois weapons?"
[Typing]
Boy 1 I was sitting here.
[Singing]
Boy 3 "How did the Iroquois make weapons?"
Boy 1 I was sitting here.
[Complaint]
[Laughter]
Girl 1 She told you to leave.

Boy 1 No, she told me...
[Laughter]
Boy 1 I was sitting here. That's what you get.
[Laughter]
[Singing]
Boy 4 "Hawk clothing". Oh, "Mohawk!" I thought it said, "Hawk". All right.
Boy 1 He thought it was a "Mohawk". He thought that you said "Mohawk". He thought it was a "Mohawk"
Boy 2 All right. Let's try in something different. -- [Crosstalk] -- "How did animals help... How did they help..."
Girl 1 [Inaudible] [09:22] "Mohawk clothing in history".
Girl 2 "How did animals find food through history?"
Boy 2 "How did animals? How did animals? How did they help? How animals help make Iroquois weapons?"
Boy 1 She was just...
Boy 2 Come on...
Boy 1 Girl 1. She is just here clicking different things.
[Girl 1 grunting]
Boy 2 Com'on!
Girl 1 I can't handle this group!
Boy 1 Cause you are trying to be the boss of the group
Girl 2 You want Boy 1 dot com.
Girl 1 No, I'm not.
Girl 1 I'm trying the find the answer that we can write it down.
Boy 2 Come on...
Boy 1 But you are trying to be the boss.
Boy 2 Come on...
Boy 1 That's why he said, "How did the animals help...?
Boy 2 Make "Iroquois weapons".
[Laughter]
Boy 3 "How did the Iroquois make weapons out of animals?"
Girl 1 "Weap animals".
Boy 2 "Weap animals".
[Laughing]
[Typing]
[Whispering and laughing]
Boy 3 Jo. You forget the "P" in the middle. Now that you said the P it really sounds like the...
Boy 1 Weapo. Weapon. Weapons.
Boy 2 Cheese, say Dre's Cheese weapon. Stop the cheese.
[Laughing]
Boy 3 Weapons.
Boy 1 Weapons and clothes.
[Singing]
Boy 2 I know how to make clothes out of animals. They took off their skins then they put it on something a blanket or something.
Boy 3 And they put fabric on the inside so none of that gooey stuff gets on your, on you -- and wear it.
Boy 2 People like this?
Boy 3 Then you put it on and it's like, ah!

Boy 2 Once I was watching this show with a guy and he cut off the skin, cut off the skin of the whole bear and [crosstalk].
Woman Why did you choose that website?
Girl 1 Well, it's says that, It says that, it says that, it says that...
Boy 2 It cut a hole in the bear and then he put his face in the bear's mouth. And then his mouth is face out of the bear.
Woman That was scary.
Boy 1 Yeah, some people can do that.
Boy 2 He's like this. He's like this.
Woman So why did you choose this website.
Girl 1 Because it says "Spears, bows and arrows" cause we want to know "How did the Iroquois made weapons out of weapons..." -- [Crosstalk]
Boy 2 Look. They used bones. They used bones. They used bones
Girl 1 Wait "...animals out of weapons".
Boy 2 I said, "They used bones".
Girl 1 I'm reading it right now.
Boy 2 They use bones [crosstalk].
Boy 1 It shows it right here. They use bones. A bone! Now, why did they use spears?
Boy 2 They only uses arrows?
Girl 1 No, they use spears. They use spears. You all made Girl 2 move.
Boy 2 No, Boy 1 did.
Boy 1 No. I told her to hop over, hop out of my seat.
Boy 2 All right, we are serious now. We are serious now.
Girl 1 I think I found the reason why...
Boy 3 I'll go get the paper.
Girl 1 It's how.
[Inaudible] [00:12:39]
Boy 2 So, if we are allowed to change the words -- [crosstalk].
Girl 1 I'm reading it.
Boy 2 We can change the whole thing. Or maybe we can hack, we can hack into the TV and make it go a site called Boy 2 dot com.
[Laughter]
Boy 1 Or we can hack into the fishes.
[Inaudible] [00:12:59]
[Singing]
Boy 1 Want to tell you to stop [Inaudible] [00:13:13] in my face right now. Phony if you keep doing...
Girl 1 Just get on their weapons. No you can't make it--
Boy 1 If only if you keep on right then.
Girl 1 Are you here?
Boy 2 No, he is making me laugh. All right. "When people think of ame..."
Girl 1 I'm right here!
Boy 2 "Knuckle Heads"
Girl 1 What?
Boy 2 "Discovered the American people of more..."
Girl 1 "Arrowheads". We can't use that paper.
Woman No, you can.
Boy 1 [Singing] I almost got to in your face--
Girl 1 Be quiet. [Crosstalk]

Boy 1 [Singing] Face the screen.
Boy 5 That looks like GTA.
Boy 1 Why would I look like GTA?
Boy 5 It does. Cause...
Boy 1 Oh yeah! Cause they don't know anything.
[Laughter]
Boy 1 I'm not doing.
[Crosstalk]
[Reading] [Inaudible] [14:30]
Girl 1 I read it! I think we've got the answer.
Boy 2 You see? They use bones.
Girl 1 I think we've got the answer.
Boy 1 No, but know we gotta do what they do with clothes.
Girl 1 We already know. You don't have to know about the clothes.
Boy 1 Yes. They don't use bones to put the clothes on.
Girl 1 We do not know. We don't have to know about the clothes. We know about the clothes.
Boy 2 Actually, sometimes they do use bones. They use bones to skin it.
Boy 1 It says, "How do you use bones in Iroquois clothing. Clothing!"
Girl 1 You cannot spit on my face.
Boy 2 They use skin and bones.
Boy 1 And weaponry!
Boy 2 Boy 1, can you please sit [Inaudible] [15:12]
[Typing]
[Laughter]
Girl 2 We got that from the Internet. That--
Girl 1 [Crosstalk] Excuse me Girl 2.
Girl 2 They had something like. They had like a... -- [Crosstalk] --
Boy 2 I'd be like this, "Hey yow".
[Typing]
Girl 1 I didn't. [Crosstalk]
[Chatting]
Boy 2 Jo. Jo. What if Janiya went like this? [Crosstalk]
[Laughter]
Boy 1 She's the only girl.
Girl 1 I'm going to write down something, guys, be right back.
Boy 2 No, it's not time up. All right it's time for me to.
Boy 1 Time for me... Time for me to watch me work.
Woman Stop, look and listen.
Group: Okay.
Girl 1 Excuse me.
Woman Stop. I'm waiting for serenity. Each of you get one of these papers... Wait hold on, because many times I have papers that have no name on it. You ready?
Group: Yes.
Woman Write your name on it and today's December the second.
Boy 2 Guys, we need to make a plan to see how we are gonna make her jealous.
Boy 3 How can we do this?
Boy 2 I'm writing it down ink and stuff.
[Laughter]
Boy 1 What's up? I'm a hommie.

[Crosstalk]

Boy 1 Jo, what are you doing pushing all the way in?

Girl 1 I need one. A paper. Give me one

Boy 1 She pushed it all the way in

Woman Why?

Boy 2 Move over. Move over.

[Inaudible chatting]

[Singing]

Girl 1 I need paper. I need a paper.

Boy 3 Where did you get that pencil?

[Inaudible] [17:58]

Girl 1 Jo! Now let's go back. Let's go back. We gotta do something.

Girl 1 Clothing and weaponers.

Boy 3 Stupid little...

Girl 1 I can't! Leave me the fuck alone. Like, you think I can think.

[Typing]

Boy 2 Apparently. If you went to school.

Girl 1 And make weapons.

Boy 2 And you did your work.

Girl 1 Make clothes and...[Typing]

Boy 2 I'ma write this down on my words.

Girl 1 And... I'm gonna write some of it in my own words too. "Iroquois weaponers".

Woman These, I don't want to see here, because already somebody wrote on the cushion seats.

Girl 1 No! It's supposed to be "Weaponers".

Boy 2 "Weapon-ry". Stewy Head.

Girl 1 It says on the paper right?

Boy 3 Exactly.

Boy 2 Do you have some problem with him?

Girl 1 Yes, I have problems with him.

Boy 2 Are you having some problems with him? Hey, fuck you man.

Boy 3 Native Americans invented weapons.

Boy 2 Hey jo, shut up.

Girl 1 I'm gonna write some of this.

Boy 2 All right. "The Iroquois made clothes and weapons."

Girl 1 I found it on the Internet. You didn't find it on the Internet.

Boy 3 Okay.

Girl 1 Why do you write like that?

Boy 2 I'll say with.

Girl 1 Animals? You know why? You want to copy? I'm not.

Transcript Session 12

Boy 1 I'm typing.

Woman What are you typing in today?

[Typing sound]

Boy 3 & Boy 2 Yeee.

Boy 1 "Explain, why solids conduct electricity better than liquids?"

Boy 2 "Explain Why, why solids...?"

Girl 1 "Conduct..."

[Typing sound]

Girl 1 [Inaudible]...take turns.

Boy 2 No, I don't. I don't.

Girl 1 You all don't need to put "Explain".

Boy 1 What the?

Girl 1 Just put it in ask dot com.

Girl 2 We don't need any advice. We wanna try to do on our own first. Jez. Can't people try first?

Boy 2 Okay. Where in ask dot come do I get it first if we still have to tell it to them? We still have to type it.

Girl 2 No, no, no. Type in the question first. Maybe it would be better to type the question first.

Boy 2 We are.

[Typing sound]

Boy 2 I'm not gonna go no ask dot come, cause you gonna have to type the question on that site too.

Boy 1 I know, write that.

Boy 3 What the? Jo, this computer is dumb.

[Mouse tapping while a participant is typing]

Boy 2 Wait [pause]. Just stop doing [pause]. Just stop pressing stuff.

Boy 3 That's why it should be touch screen so that you can be just like this.

Boy 2 Don't, don't, don't stop the thing.

[Whispering]

Boy 3 If this was touch, it would make it much more easier.

[Typing sound]

Boy 2 That's why you have the thinking.

Girl 2 It's a 'C'. You gotta go back.

Boy 2 He keeps on [pause]. Clicking the, um, thing out.

Boy 1 I'm not clicking the thing out.

[Mouse tapping]

Boy 2 [Yelling] But you keep on moving the mouse. I can't [pause].

Boy 3 Just calm down.

Boy 1 I'm not doing like this.

Boy 3 Chill! chill!

Boy 1 Am I? am I? Jesus Christ!

Boy 3 Chill, chill, [singing], chi, chi, chill.

Girl 2 It's really that. Use your common sense men.

Boy 2 When you say it like that.

Girl 2 Use your common sense. Use your common sense men.

Boy 3 Chill out!

Girl 2 Use your common sense man!

Boy 3 "Explain why solids conduct electricity".

[Chatting on the background]

[Typing sound]

[Mouse click]

Boy 2 That says, "Does liquid conducts electricity better than metals?"

Boy 3 Yes.

[Quiet]

Boy 2 : Look, see, it's right here. Wait. No, no, no it's not that.

Boy 3 But wait.
Girl 2 Answers dot com.
[Inaudible]
[00:03:25]
Girl 2 Answers dot com.
[Chatting]
Girl 2 What are you guys doing?
Boy 2 Come on. Leave. That's what I mean.
[Chatting]
[Mouse tapping]
Boy 3 We can just use text [interrupted] and it'll be like.
Boy 1 What are you controlling the mouse for? Jez.
[Mouse tapping]
Boy 1 Who is getting to trouble?
Boy 2 That's you.
[Inaudible] [03:53]
[Mouse clicking]
Boy 2 No. That's not it! It says [pause]. That's liquid and metals. So that one is saying does liquid conducts it better than the solids.
Boy 1 No, it doesn't.
Boy 2 Yes, it does. It says, "Does liquid conducts electricity better than metals?"
Boy 1 Go right here. Can you put it right here?
Girl 2 That's the answer. It has the answer [pause] I mean, that's the question. It has the answer.
Boy 1 "Why solids conduct electricity better than liquids?" It says it right here.
Boy 2 Heat. Conducts heat.
Boy 1 Heat, it's the same thing.
Boy 2 Electricity and heat. It's not the same thing.
Boy 1 Ah! You just spit on my face.
Woman Guys, why did you choose this site?
Girl 2 Why did we choose this site? Because [pause] I believe it might have our answer.
Woman How do you know?
Boy 1 We read it.
Girl 2 Well, the first site...
Girl: Can I go to the bathroom?
Woman Yes.
Girl 2 Because the first site...
[Singing]
Boy 2 It says, "While in solids the molecules that make up them are closely packed together, so heat can be transferred from one another quickly. However, in liquids the molecules that make them up are further apart so heat cannot be transferred from, from one to another as quickly" I did not hear the word electric or anything like that.
Girl 2 Oh!
[Mouse tapping and mouse clicking]
Boy 1 Let's try metals.
Girl 2 Because it has to have the word electric in it.

Boy 1 What the?
Girl 2 Not every answer has to have the word electric in it...[Interrupted]
[Mouse clicks]
Boy 1 Now it won't let us go back.
Boy 2 It's because you went back too much.
Boy 3 Exactly.
Boy 2 Oh, so you are now going back to Google search.
Woman Why? Why did you guys go back?
Boy 1 Because it ain't our answer.
Woman How do you know?
Boy 2 We read it.
Woman But what did it say?
Boy 2 It said, "Since the molecules are closer together in a solid heat can be easily transferred" but they are talking about heat. We are talking about electricity.
Woman Oh! Interesting.
Girl 2 Let's press in video. Maybe it... [Inaudible] [00:06:10]
[Mouse click]
Boy 3 Really? AHH.
Boy 2 No, this is not it...
Boy 3 Let's go to "Kidz Search".
Woman Boy 1, why did you go to videos?
Boy 1 Because it would be easier. Because with videos it would be easier.
[Singing]
Boy 3 You just yawn. You just yawn. Get away from the TV.
Boy 2 No! I was singing. Nice.
Girl 2 Oh, he just yawned.
Boy 1 I can read.
Girl 2 No, cause he just yawned --[Inaudible] [06:44]
Boy 1 We was not, I was not yawn.
[Singing]
[Mouse click]
Boy 2 You told me to press the button? [Pause] Zoom in, I can't read.
Girl 2 See, I told you. I'll be a better thing.
Boy 2 [Singing] Square, square.
[Mouse click]
Boy 3 Why can you just let me try to find a better answer?
Boy 1 Holly crap!
Girl 2 It has six answers! [Pause] "Does liquid electricity conducts better than metal? Medals? Metals? Materials? Middles?
Boy 1 Press zoom.
Boy 2 Metals!
Girl 2 Metals.
Girl 2 "I'm doing, a fifth grade, a fifth grade scientific project on this and, and just need, and just need, on this and just need some".
Boy 2 & Boy 1 "Pointers".
Girl 2 "On how to get started. I have to write a page, a two page report, and I just have" [Pause] Oh no! [Yells] This has nothing! Nothing. I tell you! Nothing!
Boy 1 You have to click harder.

Girl 2 He is talking about the science fair and we are talking about our question. This is not helping us at all.

Boy 1 Okay. Go back. Go back.

Boy 2 Oh my god!

Boy 1 Wait. Try to find people. Wait a minute. How did they find it but...?

[Quiet]

[Boy 2 humming]

[Mouse tapping and clicking]

Woman Stop, look and listen.

Group: Okay.

[Mouse scrolling down page]

Woman Guys, you have about five minutes and I am going to give you the paper. All right?

Group Okay.

[Chatting on the background]

[Mouse click]

Boy 2 They have the site.

[Typing]

Boy 1 But didn't we went there?

Boy 2 Yeah, but we went to the wrong article! They're in Answers dot com. It says, "Why do solids conduct electricity better than liquids?"

Girl 2 Okay.

Boy 2 We went to the wrong article.

Woman Why are you doing answers dot com?

Girl 2 Because they have it and we just, we just went to the wrong article.

Boy 2 What do you want?

[Mouse clicking several times as typing in virtual keyboard]

Boy 1 I give you both of my --[Inaudible] [10:09]--.

Girl 2 Okay.

[Chatting]

[Typing on keyboard]

Boy 2 Remember that game we play --[Inaudible] [10:40]--.

[Typing]

[Chatting]

Boy 2 That game was cool because it came with one of my electronics. I wanna play that game again.

[Typing]

Boy 3 Yeah, me too. But it only let's two people in it. It's not fair.

Boy 2 Yes, it is. Beside, I have seen one of the, um, one of the animals trying to...

[Chatting]

Boy 2 It was that yellow duck.

[Laughing]

[Mouse scrolling up and down the webpage]

Boy 2 I have an answer, sort of. I have a answer, sort of.

Woman What is it?

Boy 2 Um.

Woman Talk to your team. Talk to your team.

Boy 2 Well. It's usually. It's usually. It says on the thing, is not or it's true, because some, some liquids are electro rich so they can, so they can generate... Like, remember the potato, the potato thing with the juice?

Boy 3 Yeah!

Boy 2 The potato thing. How the...? [Pause] It's because the juice generates the electricity and [interrupted].

Boy 1 And the electricity [interrupted].

Boy 2 [Yelling] Jo. What you doing? It's right there! We need the whole article.

Boy 3 I'm in this group tho.

Boy 1 [Yelling] no, you are not. We already got four people.

Girl 2 No, I'm in the group before him. So, he had to go.

[Chatting]

[Typing]

Boy 2 [Yelling] This is not the... Grrr!

Girl 2 Relax!

[Singing]

[Chatting]

[Sound of clicking mouse]

Boy 1 What the hell? There is no information on here?

Boy 3 ...making fun of the celebrities on it.

Boy 1 Why there is no information on here?

Boy 2 Maybe because the page didn't load fully.

Boy 1 Oh!

Girl 2 Maybe it was on the other one?

Boy 2 No, this is the one we was on, but we didn't have the whole thing.

Boy 1 You know what?

Boy 2 This is not the whole true.

Woman Stop, look and listen.

Group Okay.

Woman If you think that you have the answer please send one person from your team to get the paper.

Boy 2 Boy 3. Go.

[Chatting]

Boy 3 Somebody said. Somebody said, "This is for boys".

[Inaudible] [15:40]

Boy 2 You got lined up?

Boy 3 Yeah.

Boy 2 She moved ones. She said. Cause when you are playing by yourself, the animals try to move by themselves.

Boy 3 Yeah.

Boy 2 But the lumpa is the only one that can move by itself because he is the only one that has to be controlled by a person.

Boy 3 I bit 20, 20. 20 to 22. That thing is hot.

Boy 1 Have you ever got passed the kids mane?
Boy 3 I restarted my whole game. Again.
Boy 1 We have to say it in our own words.
Boy 2 I know.
[Singing]
Boy 1 Boy 2! Taking up the whole damn thing.
[Chatting on the background]
Boy 2 What?
Boy 1 Jo. She cannot see, she is writing.
Boy 3 Why can you both be writing? [Pause] Why did you have to put the paper back? Give it to somebody else.

Transcript Session 13

[Children talking thoroughly]
Boy 1 Move over [Boy 1 spells name] -- [crosstalk]
Woman Okay, here we go. I'm going to put this hear so I that I can audio record.
Girl 1 No...
Girl 2 No...
Boy 2 She got a new -- [crosstalk]
Boy 1 Move over Boy 2.
Boy 2 She a got new phone case.
Woman I hope you have enough time. [crosstalk]
Girl 2 Jed.
Boy 2 No, what you doing to me? Get out of here -- [crosstalk]
Girl 2 Why am I not coming?
Boy 1 Now you want come.
Boy 2 Exactly, why are you coming here?
Boy 1: They are looking at it.
Girl 2 You got to be kidding me.
Girl 1 Exactly. You got to be kidding me. [crosstalk]
Girl 2 Yes I -- that's what I'm trying to tell you.
[Keyboard typing]
Girl 2 I don't love this day... Oh God.
Girl 2 You take. I use it.
Girl 1 Oh, watch it...
Girl 2 What the heck...
[Laughter]
[Drum tap]
Woman That’s enough Boy 1...
[Laughter]
Woman I heard so many things when I'm just trying else -- [crosstalk]
[Laughs]
[Cabinet squeaks]
Boy 2 Don't turn, that does not sound. Do not seek hers [inaudible] [00:59]
Woman Right. Okay boy how do you -- hold on...

Boy 2 You should put it in your own words like that and it will just pop out something and then we will just got to answer. We read it first and then we put it in our own words.

Woman Exactly.

Boy 2 Then just tell them, exam. We tell you the answer and then we got all [inaudible] [01:22] we have to put it in our own words.

Woman That's the process?

Boy 2 We have to put it in our words because it specifically says on the fourth rule, precedent your findings in your own words.

Woman Can you spell your name?

Boy 2 [Spells name].

Woman [Spells name] right?

Boy 2 E-I-N...

Woman I always put J-E... [crosstalk] I don't know why..

Boy 2 I know Ms. Wajes do that too.

Boy 1 My name is Boy 1 -- [crosstalk] [Spells name].

Girl 4 [Girl 4 spells name]

Woman [Girl 4 spells name]

Boy 1 Alicia's all alone. Rosalie and this was surprising to us. My name strikes on the old chicken [inaudible][2:09] to S-T-A-Y-K-S on [inaudible] [02:11]. How about social Merch…

Boy 2 I love Seoul so much. l learn different things... Every time I come home from Seoul -- [crosstalk]

Girl 5 I'm leaving...

Boy 2 When my friends from my child school, I told my sister different things.

Woman How do you say so?

Boy 2 Right... What? She's tall. She goes to the grad democracy pub right there.

Woman Oh no way. Okay. You're teaching twelve years old?

Boy 2 Different things because she got to teach about Math just like the old class. She's always annoying to me.

Woman Well, that's the sister's job.

Boy 2 Right, that happens to your sister?

Woman Yes.

Boy 2 You always get in a fight with her.

Woman Yes.

Boy 1 I just don't know that is the this -- [crosstalk]

Woman Why do you choose that side?

Boy 1 I some [inaudible] [03:02].

Woman Let me see Boy 2.

Boy 1 Go back.

Woman Boy 2, why do you choose that color?

Boy 2 I choose that color thought I would have information but it really doesn't.

Woman You thought would have what?

Boy 2 I thought it would have information but it doesn't. Wait, we got to see it first if it really does because we didn't log in. See, its huge volume of water so the electric -- this is the answer. Why don't office [inaudible] [3:29] light and strikes does he.

Woman How do you know that's C?

Boy 2 C because… [crosstalk] C is..

Boy 1 It tells us the percentage. C is [crosstalk] a huge [inaudible] [03:28] of voltage so the electricity and lightning disappears very quickly.

Boy 2 C is a huge....

Boy 2 I guess if a fish was near a rough surface at the point of a lightning it's like it might get fried [crosstalk] but...

Boy 1 Fried, otherwise it's fine...

Boy 2 Should I like this?

Boy 1 I like this one. Let me just go down to this room. This is a very good question... [inaudible [04:07 -12]. Game. [inaudible][04:168]. We're down the same level.

[Humming]

[Door slammed]

Woman That's okay.

Boy 2 I don't want to go.

Boy 1 Goodbye Bro. I'll go back. You do it first time and minor check don't you.

Woman Why do you choose it?

Boy 1 The fish, let me see.

Woman Why didn't you see the...

Boy 5 I choose the only one wait -- so this one. I choose that one because it has, I think, famous scientist on it so I think they will all answer but that's it.

Boy 1 Lightning form electricity charge clog creates a channel on to the air.

Below it call a leader [inaudible] [05:53] at the same time and oppositely charge leader girls upward from the ground. Leaders cannot be used current typically 30,000 E-P-S follow down this chin. Seawater are like air a good conductor as it contains salt rather than creating a irregular narrow and solid pass the charge from the lightning strike parts spread out this time with downwards and expand it half sphere from the surface. Any fish within a few ten of electricity of the same strike point would probably be killed beyond that. They would just feel a tingle. I'm learning something new today.

Boy 1 I like this whole thing. You got to put it in your own words.

Woman You can touch it.

Boy 1 I like this whole thing.

Woman It's not hers. Later, that's what he was trying to listen to right. Okay, I'm going to look at her answer. Okay....

Boy 1 No because you light one this...

[Laughter]

Boy 1 We got to put it in our own words now, can you get paper...

Boy 2 No, we have to tell the answer first in our own words. Lightning forms when electricity charge -- this one or read the answer.

Boy 1 Yes I read this.

Boy 2 [inaudible] [08:07] you...

Boy 1 Listen to me.

Woman So what's the answer?

Boy 1 We got to [crosstalk].

Boy 2 If some of the fish are in ten trees away then might get killed but otherwise if they are under ten I mean over ten trees away they won't get killed.

Woman Wow, okay.

Boy 2 They are not close to it. They are apart. The lightning is right here, they're right here. If the lightning's right here they would have got hit [crosstalk]

Woman More about that because [inaudible] [08:44] old fish style.

Boy 5 They are on the water right there.

Boy 2 That is minus – [crosstalk]

Boy 1 Wait I got to see something, you want to read this?

Boy 2 Yes, I will going to read this and if it said that -- close the door. If it said that I forgot it. If it said that we you sunk it on water and the water freeze. If they have been on water it would have got struck. You see when they got into water, you see the lightning is going to house they fire. You see the water that throws in because they are on the water. The fish are on the water and the lightning now go into the water right but it doesn't matter because the water completely the lightning K-E-L. Take the lightning away by throwing like [inaudible] [09:52][crosstalk]

Boy 5 When the lightning goes in so you're saying that the water is protecting the fish?

Boy 2 Yes.

Boy 5 From the lightning striking them?

Boy 2 You see fire right. I attempt to feed on water so you see what I'm trying to say you feel me?

Boy 1 Yes.

[Laughter]

Boy 5 Oh men...

Boy 1 Why are you here Boy 5 [crosstalk]? Shut up.

Boy 5 We all go here with one cause and [inaudible] [10:19]

Boy 1 We're all going on a different website. As long as different --

[crosstalk]

Boy 2 Wait, let me read it, let me finish reading it. Do fish die --

[Humming]

Boy 5 We got the same answer I heard.

Boy 2 Don't forget to put it in your own words.

Girl 6 Okay, we would finish that some time by these days..

Boy 1 Stop touching it.

Girl 6 I didn't press anything anyway.

Boy 1 You want to [inaudible] [11:06]

Girl 6 Oh and this you know...

Boy 3 That's the point. [crosstalk]

Girl 7 Yes, he has the answer.

Woman Just the paper, Boy 5.

Boy 5 Okay, why do I have to do everything.

Girls Bye, teacher.

Boy 3 J.D., I have something to tell you.

Boy 1 Stop Boy 5.

Boy 5 : No, [inaudible] [12:25]

Boy 2 Just rip it. It's going to come off. [inaudible] [12:40]

Boy 5 That's too big.

Boy 4: It's not, It's got enough. Mine has got to blow.
Boy 5 Oh we see this, I might us see the other one.
Boy 2 Alright, we're the leaders.
Boy 5 Okay.
[Laughter]
[Children talking]
[Boy singing]
Boy 5 We need a new glue to hold that. It doesn't work.

Transcript Session 14

Woman Better one of the stations [classroom noise throughout]
Girl 1 I didn't like my group.
Woman Okay, so today the question is, using alternative energy; explain how we can light up our Christmas tree.
Girl 1 Okay.
Boy 1 What it is?
Girl 1 Don't do that.
Boy 1 What?
Girl 1 Stop!...
[Classroom noise throughout]
Girl 1 Explain... [typing throughout] [background noise]
Boy 1 You're from?
Girl 1 [Laughs] Gaddy!... [background noise] how we can light up a--
Boy 1 A Christmas tree
[Background noise]
Boy 1 What are those?
Woman Can you please close the door?
Boy 1 What are they asking you -- [classroom noise]
Girl 1 Designer's Solicidy. Remember that were doing that this year in our class?
Boy 1 Oh, yes. We are.
Girl 1 How do holiday lights work--
Boy 1 No.
Girl 1 --in generating form of alternative energy. Yeah, maybe I'm going to try that.
[Background noise]
Girl 1 Unable to download, saving energy [1:23] [inaudible]
Boy 1 I want to get recorded too.
Woman [laughs] That's why.
Girl 1 No, this has nothing to do with that.
Woman How do you spell your name?
Girl 1 [Spells name]
Boy 1 You never asked for my name.
Woman I know how to spell it. How you spell your name?
Boy 1 [Begins to spell name
Woman [Says Boy 1 name], right?

Boy 1 Yes. [Boy 1 spells name].
Woman Why did you choose that style?
[Background noise throughout]
Girl 1 Isn't it done?
Boy 1 Because it's—
Girl 1 What is the important of this?
Boy 1 It's about Christmas.
Girl 1 Okay.
Boy 1 It's according--the question about Christmas lights so I chose here because it's much easier and I could type in. Instead of using lights because it's basically about Christmas lights, I'll just write "how does alternative energy work?"
Girl 1 Alternative energy work [2:23] [inaudible]
Boy 1 Hey, I put that because I was like this uhmm, and uhmm.. [sigh] then that showed up?
[Background noise]
[Typing throughout]
Boy 1 Wait, wait. Oh, photo? Ms. Natalia, are you sure that you're recording because it's on camera?
Woman Yes, yes.
Boy 1 It's on camera.
Woman Is it?
Boy 1 It's on camera.
Woman It can do both at the same time.
[Background noise]
[Typing throughout]
Boy 1 [Inaudible][3:29] for winter break? it's on Friday.
Girl 1 I can't wait because I get to jump in a pile of snow. It's pretty snowy by where I live. "Can light up Christmas tree."
[Background noise]
Boy 1 Girl 1, the reason why I don't like falling in snow because...

Girl 1 it could be dirty sometimes.
[Typing throughout]
Boy 1 No. About that dream of mine, it was true.
[Background noise]
Girl 1 This is not what I am looking for. [whispers] I'm going to go and ask.com because it can basically answer any type of question.
[Typing throughout]
[Classroom noise]
Boy 1 [5:33] Okay.
Woman I'm going to see who's going to explain the answer to me.
[Whispers]
[Background noise]
Boy 1 [5:56] I want you to guess what I ask.
[Typing throughout]
Woman [6:23] I'll get you on Wednesday.
[Typing throughout]

[Classroom noise]

Girl 1 [7:13] What is happening?

Boy 1 You are on sound tuning..[7:17] [inaudible] Okay. [7:33] I'm [Boy 1 states name]. [voc]

[Background noise]

Girl 1 [8:18] I think I know I think I know.

Boy 1 What?

Girl 1 How can you [crosstalk]

Woman I'm getting a lot of things [8:30] [inaudible]

[Background noise]

Boy 2 How can you use that tool [crosstalk] text machine?

Boy 1 I'm getting this new game on [8:55] [inaudible]

Boy 2 It's a party for all.

[Classroom noise throughout]

Boy 2 [9:17] Oh sorry, [crosstalk] I was just want to ask.

Boy 1 Hundreds of bucks.

Woman As I was able to do [9:30] [inaudible]

Students [9:35] Okay.

Woman Okay. Stop, listen.

Students Okay.

Woman Stop. Instead of asking people to leave because I see lot of who are not working and that's not okay. You know who you are. Do not leave unless you have to leave okay?

[Typing throughout]

Boy 1 National energy...

Girl 1 I mean national resources.

Boy 1 I'll press space for you.

Girl 1 Oh, sorry.

Boy 2 Not so far. Stop.

Woman Girl 2, you're going to be the first one.

Boy 1 You don't know how to spell Christmas. You could just press this.

Woman [Inaudible] [00:11:02]

Girl 1 Oh my gosh.

Boy 1 Go down the other one. Don't see your [Inaudible] [00:11:23]

Girl 1 [Inaudible] [00:11:29] Washington DC.

Boy 1 What ornament was not lit in 1979 National Christmas Tree lighting? Look, I found the answer.

Girl 1 This is about ornaments.

Boy 1 Oh.

Girl 1 Ornaments are just things that you put on the Christmas tree as a design.

Boy 1 I know that. I wonder what you want for Christmas.

Girl 1 What?

Boy 1 I wonder what you want for Christmas.

Girl 1 Me?

Boy 1 Yes.

Girl 1 I just want a lot of stuff. I don't care what it is. Do not get me any Barbie dolls, I hate Barbie dolls. If I ever get one I'll rip its head off.

Boy 1 I got you something already.

Girl 1 What did you get me?

Boy 1 I can't tell you. I'll tell you the first part.

Girl 1 If it's a Barbie doll, I will rip its head off.

Boy 1 I didn't get you that.

Girl 1 Okay, good.

Boy 1 I got you something else. I got you your own waterslide.

Girl 1 What the heck?

Boy 1 I'm dead serious.

Girl 1 No, you didn't.

Boy 1 Yes, I did. What are you talking about?

Girl 1 Are you completely sure?

Boy 1 I'm sure.

Girl 1 What I really wanted for Christmas was my own big packet of Pringles.

Boy 1 What?

Girl 1 I want seven packets of Pringles for Christmas.

Boy 1 What?

Girl 1 How does that keep happening?

Boy 1 I don't know.

Woman What's happening?

Girl 1 Every time I go to Google and try to type in the question it's just coming up and back up there.

Boy 1 I think you have to delete this. No Brussel sprouts.

Girl 1 I hate Brussel sprouts.

Boy 1 No, how can you use Brussel sprites to light up the Christmas tree?

Woman That is so smart, Jeremy.

Boy 1 Ms. Natalia, the only reason why I'm saying that is because I'm hungry.

Woman Is that why?

Boy 1 I mean, sometimes you could.

Woman What?

Boy 1 I said sometimes you could.

Woman Okay. Did you have [Inaudible] [00:14:16]

Boy 1 This year I'm going to put popcorn and raspberries on my tree.

Woman For the reindeers?

Girl 1 I'm going to have caramel popcorn, it's a movie night. I think I found one.

Boy 1 Really?

Girl 1 No. Yes.

Boy 1 I was pointing to that. No, but that's the ceremony.

Woman [Inaudible] [00:15:08]

Girl 1 I forgot. There are [Inaudible] [00:15:10]

Woman Is that not it?

Girl 1 No.

Woman How do you know?
Girl 1 Because it's telling me stuff about the ceremony.
Woman Oh.
Girl 1 At city hall.
Boy 1 I've never been there before.
Girl 1 I've been to city hall, my sister goes there every five years.
Boy 1 I wish school was over. I want to go to that interview for [Inaudible] [00:15:39]
Girl 1 What?
Boy 1 I'm dead serious, I'm having an interview.
Girl 1 What? How come you don't know who invented Christmas lights. I do.
Boy 1 Who?
Girl 1 Me.
Boy 1 No, Thomas Edison.
Girl 1 My daddy's name is Thomas.
Boy 1 But not Edison.
Girl 1 Yes, his name is Thomas [Phonetic] [00:16:14] Lindt.
Boy 1 If his name was Thomas Edison, he would be dead. He died in 1805.
Girl 1 My dad was born in 1968.
Boy 1 My mom was born in 1981 and my dad was born in 1971. That's like ten years. My mom is 33.
Girl 1 My dad is 48.
Boy 1 My dad is 45.
Girl 1 Your dad was born in 1971, right?
Boy 1 Yes.
Girl 1 So, my dad is 44. I can't wait to smack him. I always do that for fun, he allows me to do it.
Boy 1 Stop.
Girl 1 Alternative Christmas tree encyclopaedia.
Boy 1 Look.
Girl 1 It's not working.
Boy 1 We detected you're using an older version of Google Chrome. Want to know where I see that?
Woman You have about two more minutes, and I don't think tomorrow you will come here, because you're suspended and you did not come [Inaudible] [00:17:57] Finish the course. Keep going.
Boy 1 What? that sucks. Are you tired?
Girl 1 No. I go to bed every day at 4:45 in the morning.
Boy 1 You really do, I can see it in your eyes.
Girl 1 I never get tired, I don't really sleep at all.
Boy 1 What? Everyone has a --I saw this funny video [Inaudible] [00:18:46] but it was mad small. His tree was hanging on the wall, and then his presents were on the floor, like a band aid.
Girl 1 Chicken.
Boy 1 Stop with the chicken.
Girl 1 I have a booboo.

Boy 1 I really don't like what you did to me a lot of times.

Girl 1 Who, me?

Boy 1 You used to hit me in the head. I miss that.

Girl 1 Poor puppy.

Boy 1 Harder.

Girl 1 Poor puppy. I found the answer, but I have to put it in my own words.

Boy 1 What?

Girl 1 Christmas lights are used for decorations in preparation for Christmas. This is from my own row, stop right here. Christmas lights can help trees grow in the dark. When sometimes people are afraid of the dark – wait, that's not dealing with the question. Christmas lights are lights used for decoration.

Boy 1 How do you use –

Girl 1 She's telling you about Christmas lights, I don't feel like searching anymore.

Boy 1 I'll do it. I think you should take a break. I'll do it.

Girl 1 Christmas lights are lights used for decorations in preparation for Christmas and for display throughout Christmastide. Don't lean on this, you can make it fall. And you can make the TV fall, even though it's stuck to this. Christmastide is another word for saying... For example, Christmas is a time of the year when people use a lot of alternative lights. Alternative light is an – Boy 1, can you help me?

Boy 1 Christmas lights also known informally as fair lights are lights used for decoration and preparation for Christmas. Christmas lights throughout Christmastide. Preparation for Christmas. The custom goes back to the use of candles as decoration on the Christmas tree. People used the candles instead of lights to make the Christmas tree light.

Woman Okay, it's up. [Inaudible] [00:22:02]

Boy 1 Can I do it?

Woman [Inaudible] [00:22:10] Come back to the lily pad. I'm going to count to five. One, I will sit on the lily pad. Two, three, four and five. I want to see you sitting down on the lily pad. Leave it like that, that's okay. Can anybody find the answer to the question?

Girl 1 We did.

Woman What did you find?

Girl 1 I found that people don't only use alternative energy to light up Christmas trees. I think it said 1972 that they don't use Christmas lights to light up the Christmas tree, that they use candles, and like he said –

Woman I see, so instead of using the energy. Is there wasted energy with lights? If you replace them with something, it doesn't save lights. To save energy, that's good. Okay, that is getting very close to [Inaudible] [00:23:26], yes.

Girl 1 Well, we did get to a site that I was going to say on our paper, and our concessions and soul, you have to answer a question, like how

a dynamo produces energy. So we can use a dynamo, we can use one of those wind turbines in that question, and a couple more.

Woman That's very good, that's alternative energy.

Girl 1 Alternative energy are things that aren't harmful to the environment.

Woman Exactly. Say it again.

Girl 1 Alternative energy are things that aren't harmful to the environment and are natural resources. Like a potato, that's basically...

Woman Exactly. You could light it up with potatoes, you could light it up with lemons.

Girl 1 [Inaudible] [00:24:20]

Woman Alternative, yes.

Girl 1 But anyways, it means natural resources, so basically what we found is that [Inaudible] [00:24:43]

Woman Yes. 1000? Who said that? Who has another answer? Go ahead. What is that?

Girl 1 [Inaudible] [00:24:56]

Woman Is that a question? Okay, listen up. There was another group that found that you can use solar power. They were really into that, and that's the way actually that California, New Jersey and someplace in New York are lighting up trees, and also the street lights. It is very cool, and that's not harmful to the environment. [Inaudible] [00:25:40]

Transcript Session 15

[Children talking throughout]

Woman Okay girls I'm going to audio record you today. Today's question is where electricity goes when bolts strike the ocean and the antenna of a first day building.

Girl 1 Okay.

Girl 2 Hooray we're going to be isolated. Okay, can you type this [crosstalk] I'm taking too long.

Girl 1 Okay.

[Keyboard typing]

Girl 1 No, okay better that it seems.

Girl 2 You will.

Girl 1 Hi, wow. This is Girl 1.

Girl 2 This is Girl 2.

Girl 2 You type really fast Girl 3. My sister types fast too.

Girl 1 My mom does. [inaudible] [00:52] grownups, they're older than us. No, they had more experience.

Girl 2 No, I thought I was going to do one question and then the other question.

Girl 1 Oh okay.

Woman Okay names I have here the papers.

[Laughter]

Woman What's your names?
Girl 1 Girl 1
Woman Girl 1, how do you spell that?
Girl 1 [Girl 1 spells name].
Girl 2 [Girl 2 spells name], Girl 3, [crosstalk]
Girl 3 No... [Girl 3 spells name] yes.
Girl 2 Oh fine, I forgot the O supposed at the A.
Girl 3 Usually no plan.
[Singing]
Girl 2 When bolts strike the ocean. Okay. Wait you don't need. Let's see just let.
Girl 1 Look at your name here.
Girl 2 Right there.
Girl 1 I know, let's just check this one out first and then we can go on.
Girl 2 Yes, lightning strikes water.
Girl 1 I saw an answer there.
Girl 2 Wait, your phone's off.
Girl 1 Don't worry.
Girl 2 This is a recording, your phone's off.
Girl 1 It's okay, he still hears us.
Girl 2 Does it?
Girl 1 Ask her.
Girl 2 Your phone's off.
Girl 1 Okay, [inaudible] [02:52] says when the lightning strikes water. When the properties of water.
Girl 2 No...
Girl 1 No? You notice on [inaudible] [03:01] I just want to look good [crosstalk]
Girl 3 Take it.
Girl 1 I know [crosstalk].
Girl 3 They actually get back on point [crosstalk]
Girl 1 I know this thing [crosstalk]
Girl 3 This is it says, I need to emphasize[crosstalk]
Girl 2 We were not talking about the current pride of fish.
Woman Why do you guys--wait it rang? Why did you guys choose that site?
Girl 3 She thought-- wait, you tell her.
Girl 1 No because I thought now almost every website you can type in question, I didn't see [crosstalk]
Girl 3 Try typing in the [crosstalk]
Woman You didn't see what?
Girl 2 That's the answer one.
Girl 1 I thought that like almost every website you can type in your question [crosstalk]
Woman Oh, you mean they have like a search engine. Oh, I see that's very funny.
Girl 1 [Inaudible] [03:56]
Woman That's why you chose that website? Science life...
Girl 1 Lightning strikes...
Girl 2 Wait, what where are you going?
Girl 3 I'm putting it on my own words
Girl 1 Maybe that more.

Boy 1 Two seconds, one, two.
Girl 1 Ellen, where are we going to enter that poll?
Girl 2 [Inaudible][04:56] going to Ask.com?
Girl 1 Yes.
Girl 2 What? Ask this one.
Girl 1 Maybe you can go to question and answer in Ask.com. When lightning bolts hit the strike-- can you bring out the S? Always right next to -- Wait, that right there you forgot the S.

[Singing]

Girl 2 Hits?
Girl 1 Yes, she put a hit.
Girl 2 Yes, that's more better.
Girl 1 I can do this. What? Wait, what...
Woman What do you write?
Girl 1 Wait.
Girl 3 Oh look! Let's try this.
Girl 1 Wait don't touch the screen.
Girl 2 Oh sorry. Oh wait... the sea? Is the sea like the ocean?
Girl 1 Yes, it's kind of like that I think.
Girl 3 See, it tells how the lightning bolt strike into the ocean. Wait let me try this. That's good.
Girl 1 I'm in dive.
Girl 3 Other people were injured in that storm in the close California. What happens then lightning hits the sea as it just in parse skin. Oh sorry, Parkinson. If you are in the sea a thunderstorm looks like lightly an area. There are two ways to cut the risk, [crosstalk]
Boy 1 This, what's this?
Girl 1 It's a lighthouse I think.
Girl 4 Looks like it's not, it look like something else.

[Crosstalk]

Girl 3 Risk of getting hurt.
Boy 1 What, what's this look like to you?
Girl 1 Don't wait among here.
Girl 3 Sweep deep.
Girl 1 Get out of here.
Girl 3 That's lightning in the sea. There's lightning in the sea. Electricity goes in the sea and then the sea makes a lightning because there's electricity in the ocean. Wait, I think that's the Empire State building.
Girl 1 I don't think so. Okay that's going to answer that one [crosstalk]
Girl 3 I think the Empire State building chords are connected near the ocean so it also might get [crosstalk]
Girl 1 I think because -- [crosstalk]
Girl 3 The ocean might get near the antenna of the Empire State building and [crosstalk]
Girl 1 Oh my God. Okay, don't talk so fast.
Girl 3 I'm sorry.
Girl 1 They can't really talk.
Girl 3 What?
Girl 1 You can't really talk [crosstalk]
Girl 3 Talking fast?

Girl 1 We can't really understand you because you're like when the Empire State antenna Empire's antenna hit the ocean -- Okay. [Laughter]

Girl 2 Wait. What if you're right?

Girl 1 I don't know, if you were right we can go back.

Girl 3 Ask. I mean answers.

Girl 1 Answers.com -- I wonder why we always go to Answers.com.

Girl 2 I don't know.

Girl 2 Now listen to me, where does the electricity-- listen to both of them because it will answer both.

Girl 1 Okay. Got a lot of typing to do.

Girl 3 You missed it yesterday, Girl 2.

Girl 2 What?

Girl 3 Yesterday, I bit my lip when my lip was reading so bad. [inaudible] [09:33-09:37]

Girl 2 Is it still there?

Girl 3 I think [inaudible][09:42]I put a lot of [inaudible][09:44]

Girl 1 In the bath room?

Girl 3 Honestly [crosstalk].

Girl 2 You forgot the O. Thank you I mean you're welcome. Kind of home and thirsty -- Oh that's the boat. Wait that's [inaudible] [10:18] already?

Girl 3 I hope that's a grand [inaudible] [10:21]

Girl 1 M, oh wait up M J State building build. Well this is wrong.

Girl 2 Yes. Go!

Girl 1 Can you use chips and chocolate, mouse sorry, mousse? That's hard to pronounce. You don't see where your answer belong?

Girl 2 Oh, there it is.

Girl 1 No... They don't have it that means they don't have it.

Girl 2 I would just do one question then.

Girl 1 Yes, one question at a time.

Girl 2 You will unclip the whole the things.

Girl 1 Sorry. Okay you want to type this Ty? I put where already.

Girl 2 I will put red. You're not going to do that.

Girl 1 Okay let's just do this thing.

Girl 2 Oh, I was watching on my nickname. Where does [crosstalk]

Girl 1 Electricity?

Girl 2 E-L-S-T-I-Y.

Girl 1 By any chance my sister looks like doll.

Girl 2 I'm C-U-T-Y.Is this one correct?

Girl 1 Elec -- C-I, city.

Girl 2 I know I was doing that.

Girl 1 No because just now you were saying C-T-Y.

Girl 2 Wait I was?

Girl 1 Yes.

Girl 2 Oh sorry.

Girl 1 Wait. That's press-- Everything's after --

Girl 2 Okay, I'm sorry Girl 1.

Girl 1 It's okay. Go when.

Girl: Five minutes.

Girl 2 I'm just going to do like this.

Girl 1 Like the screen.

Girl 2 Okay.
Girl 1 No, space. Don't go so fast so it won't -- see?
Girl 2 Oh. Oh my.
[Yawns]
Girl 2 Let's go back.
Girl 1 This?
Girl 3 I think they were lucky they went back to the website.
[Children talking]
Woman Stop look and listen.
Girls: Okay.
Woman Stop, guys can you help us find your mates and
[inaudible][14:09]
Boys: No.
Girl 3 I don't think we will be able to get the answer.
Girl 2 I can't do this. It's not doing anything.
Class: Okay.
Woman Stop. Keep going.
Girl 2 It's acting look. We can't type in the answer because this is like
[crosstalk]
Girl 1 When...
Woman Let me see...
Girl 2 What?
[crosstalk]
Girl 1 It means oh my God.
Girl 2 Lightning bolt strike-- it's not working again.
Girl 1 It's not working again.
Girl 2 I don't know, do something. Did anything do something bad to it?
Girl 1 No, I think this thing happen.
[Keyboard typing]
[Glass hits]
Girl 1 It's jamming it I guess. Jamming it would make it worse.
Girl 3 Is it no other than Jaden Anderson.
Girl 2 Try [crosstalk].
Girl 1 [Inaudible] [16:30] the glass, it's almost there.
Girl 2 Right there.
Girl 1 Enter it's done, hopefully we got answer.
Girl 3 Wait... I want to see if you can do to save this computer.
Girl 1 What are you doing? No.
Girl 3 I just like to see if that works.
Girl 1 No because that's not even the same button this is not fun. It's a
different type of toolbar.
Girl 2 [Inaudible][17:04] what you did.
Girl 3 I didn't anything.
Girl 2 You did.
[Sighs]
Girl 2 Let's go to this.
Girl 1 Let's just close them.
Girl 2 Yes, but not this.
Girl 1 What's the answers...
Girl 2 Look here. Oh we have [inaudible][17:23-17:24] again.
Girl 1 No, we don't.
Girl 2 Oh okay. Good.

Girl 3 We do.
Girl 2 Oh, wait right here.
Girl 1 Wait and I'll see if this switches.
Girl 2 Go over here. Try to type it up here.
Girl 1 Okay. Wait get up. Cancel. Kindly go up here. Where?
Girl 2 Right here.
Girl 1 Where?
Girl 2 Does -- right here. Making it happen, yes.
Girl 1 Yes! Okay.
Girl 2 You can go more.
Girl 1 Thank you. When --
Girl 2 So, yes, try -- just go down.
Girl 1 Oh here.
Girl 2 The --
Girl 1 Oh my God, I'm going to go [inaudible][19:06]
[Tapping the table]
Woman Make sure you write your first and your last name.
Girl: Here, Girl 2.
Girl 2 Thank you.
[Squeaking]
Girl 2 Thank you. Take care.
Girl 1 No, wait.
Girl 3 Why does lightning-- that's the top. Why does a lightning bolt strike?
Girl 1 Girl 3 they don't have the answer. If they have the answer it would be right here. Girl 3 we have to go to ask for help right now.
Girl 3 Oh God.
[Laughs]
Girl 3 Next time, we won't use this computer.
Girl 1 It's kind of breaking. I mean next time we need backer so we know what's happening.
Girl 2 There's no next remember?
Girl 3 No.
Girl 2 There's no next time remember?
Girl 3 Wait...
Girl 1 We have last time. No. We probably have it done.
[Crosstalk]
Girl 3 No.
Girl 1 I didn't want to play asks com.
Girl 2 Asks com? Look – Look, ask.com.
Girl 2 What does that say old tell her [crosstalk] mud pack them man Lori.
Woman Write your fist and last name. Another language?
Girl 2 I think so. Asks.com.
Girl 3 Yes, I put enter.
Girl 2 We wound a forbidden name.
Girl 1 It's not dummy because it's a -- see?
Girl 3 Sorry.
Girl 1 It's okay.
Girl 2 Wait. It says the answer right here, remember the sight? Sorry.
Girl 3 It says the answer?

Girl 2 No.
Girl 1 No.
Girl 2 It's going this way.
Girl 1 Okay sea bay says taking [inaudible][22:10]
Girl 3 It's December 15, 2015 so you would put twelve, fifteen, fifteen.
[Keyboard typing]
Girl 1 Oh my God, I can't believe I typed that it's so fast.
Girl 2 Wow. You really talked for ten seconds. How many Stanley cup --
[Crosstalk]
Girl 2 Like we did, like we said. Let's just --
Girl 1 We got over there, the other website remember?
Girl 2 [Inaudible] [23:16]
Girl 1 Remember?
Girl 2 I have to read the question.
Girl 1 We'll just waste time and today's the last day we have to guess the answer.
Girl 2 Know what, I'm just going to make up my own.
Girl 1 Come on, we can do this.
Girl 2 Where I was at again?
Girl 1 I guess we have to write the whole question.
[Laughs]
Girl 3 Okay, let's all make a note on the answer.
Girl 1 I'll put it in again.
Girl 2 We're like five seconds, one. One, two, three, four, four and a half, five.
Girl 1 Four and a half does sound funny. Okay which was it where we go. [Crosstalk]
Girl 3 I don't think it was that down.
Girl 1 Oh right here.
Woman Stop look and listen. Hands up. I need you to do this. I need you to bring me my pencils and the papers. Be careful because the little ones are waiting outside. Okay but you're going to finish this question tomorrow. Bring me that papers. Hurry up and go back to your class quietly. Go back to your class quietly. Hold on.