RESPONSE TO QUESTIONING IN THE IMMERSION CLASSROOM

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B.Ed., University of Calgary, 1987

A Project
Submitted to the School of Graduate Studies
of the University of Lethbridge
in Partial Fulfillment of the
Requirements for the Degree

MASTER OF EDUCATION

FACULTY OF EDUCATION
LETHBRIDGE, ALBERTA

January 2013

I dedicate this work to

Dr. Peter Heffernan and Dr. Martine Pellerin

Supportive and caring co-supervisors

Abstract

Students in second-language immersion mathematics classrooms can struggle to verbalize their responses to problems, how they reached the response and why the answer makes sense. Alberta curricula require that students be able to communicate their learning. This study used a qualitative research model, an action research approach to investigate systematically the purposeful use of questioning to encourage higher level thinking and student ability to express that thinking verbally in a second-language. Interchanges between students and students and teacher during mathematics activities were videotaped and these served as a record of what took place while the research was conducted. Students were surveyed and interviewed regarding their feelings about answering questions in a variety of learning situations. Students with a variety of levels of competency in the second-language were able to find ways to communicate in that language to make themselves understood and to relate the processes they used to find a response. This however does not happen if clear attention is not paid to several factors. When activities and questioning are purposefully planned, considering language acquisition, critical, complex and creative thinking, technology, collaboration, curriculum and dialogue, and questioning, students can be successful in expressing their learning. Elementary second-language immersion students are capable of expressing their thinking verbally in their second-language while problem-solving in mathematics class.

Acknowledgements

I have been supported most generously by the people in my life. Without them I would not have been able to complete this work.

My family has been instrumental in providing me the opportunity to continue my education. My husband Daniel has unquestioningly supported my quest, always a solid comfort, even when I was away for weeks at a time. My sons, Eric and Christian made sure I knew that they believed in me. My parents never failed to ask how my work was going and expressed an interest in my learning.

My first thoughts of returning to University were encouraged and inspired by Dr. Martine Pellerin. She has given me the determination to find the answers to my questions.

Dr. Peter Heffernan has been a source of information and support throughout the writing of this project.

My friends provided much needed encouragement and also much needed fun and relaxation when work was done.

My students wholeheartedly participated in my study.

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Introduction

The role that language plays in the daily life and learning of elementary-aged students has always fascinated and intrigued me. The interplay of learning a language while also learning the enormous number of curriculum objectives each year is daunting for students at all grade levels. To combine these two successfully has been my challenge for the twenty years I have worked for Rocky View Schools as a French Immersion teacher.

The question regarding what is happening when students explained their responses during Math has been of personal interest since the Western Canadian Protocol Common Curriculum Framework for Math (Alberta, 2006) was published and the Math Coaching Cohort of Rocky View Schools was established in 2005. My observation of my students struggling to verbalize their responses to problems and the process they used raised several questions that had a direct impact on my students' learning and my own teaching. It is observable that the French Immersion students have difficulty responding to questions about their process and their thinking. When they are asked to speak about their thinking, they may speak about why they chose a method, how they knew it was a plausible method and predicting if it would work in more than one problem-solving situation. The questions, which followed, among others, began piling up. Was there a language barrier that was impeding a child's ability to respond to questions? Did the child have enough vocabulary to formulate their thoughts? Was there a lack of understanding of the concepts? Did a student need repeated exposure and practice to learn how to respond? Was it simply a lack of confidence? Was the need to be correct

hindering risk-taking in the classroom? Was the level of language acquisition slowing down "math talk"? Does developmental maturity impact the ability to respond?

Literature Review

In the second-language immersion classroom, it is essential to consider language acquisition as a major factor in students' ability to relate their thinking. Students are engaged in the active process of language acquisition as well as being critical thinkers, using technology, collaborating and acquiring new knowledge through the curriculum and dialogue. The question arises as to whether these students are able to relate their thinking in the second-language. The learning opportunities provided and how questions and questioning are used can either enrich or inhibit the learning that takes place. Immersion teachers must be skilful in providing opportunities that incorporate a variety of learning situations that respond to learning styles and needs. They need to be cognizant of the types of questions they ask, the frequency at which they ask questions and have a willingness to give the power of questioning to the learner. Today second-language immersion classrooms in Alberta are comprised of students with a wide range of abilities and backgrounds. The immersion program is no longer seen as elite or for students who are considered above average (Pellerin, 2009). Teachers of second-language learners have a changing role - no longer do they just provide reading and grammar exercises, tests or arbitrary assignments for practicing oral language.

It is the teacher's job to facilitate learning while considering a myriad of factors, including curriculum, inclusion, the learners' community, cognition, language acquisition, opportunities for dialogue, skilful and productive use of technology and the

development of sound questioning techniques. Students in today's second-language immersion classrooms are expected to communicate in legitimate ways to express their learning.

Language acquisition. The notion that students can learn a second language while learning other concepts is not new, but the theory behind the creation of curricula is changing, with new emphasis on communication and collaboration. This is a benefit to the development of stronger language skills, providing learner with opportunities to use their new language while learning new ideas, facts and skills. Swain and Lapkin (1998) tell us "Language is simultaneously a means of communication and a tool for thinking" (p.320). In other words, it "facilitates task performance by mediating between us and the accomplishment of the task" (ibid). While understanding that students in a second-language program are acquiring new knowledge as well as communication and thinking skills daily, educators need to keep in mind the work of Vygotsky, who, (as cited by Swain and Lapkin,1998), argues that "cognitive processes arise from the interaction that occurs between individuals" (p. 321). Vygotsky, (1962), indicates he believes that: "The history of language clearly shows that complex thinking with all its peculiarities is the very foundation of linguistic development"(p. 68). This is the reality of the French Immersion classroom today, where according to Wise et al (2012) students arrive with diverse needs and the desire to be bilingual (p.2). Some students have individualized learning plans, others distinct behaviours or health issues. They all come to the classroom with differing expectations about the language they will learn, how they will learn it and when they will use it. The teacher's task becomes one of providing opportunities to use the new language, develop new vocabulary, all the while creating

situations where students learn concepts. Bialystok (2001) supports this when she states:

> Thus, there are strong interactions between the heard language and the conceptual system that the child is establishing. Therefore, we may not be surprised to learn that cognition is itself affected by the process of learning a language or, more specifically, the process of learning two languages. (p. 190)

There are many factors that impact how and why a child learns a second-language. According to Bialystok (2001), these can include immigration, education, and family. Further she relates that these are affected by contexts such as differences in social class, educational opportunities and expectations, access to support systems, opportunities for enriching experiences, and home language environment (p. 183). Here in Canada, students and their parents are also mindful of the existence of two official languages and the opportunity that being bilingual provides in the job market, making bilingualism (second-language acquisition) a long-term learning goal with both monetary and social benefits.

This leads to the question of how second-language acquisition or becoming bilingual cognitively benefits or inhibits the learner. Are students inhibited by their lack of mastery of their second language? Does this impede their ability to respond to questioning, to relate what they know and how they know it? When one thinks in the long term, are bilingual children able to compete academically with their monolingual peers? How does learning a second-language affect the development of cognition, metacognition and the ability to talk about these concepts in the second-language? Bialystok (2001) reassures us by stating: “The positive cognitive consequences of bilingualism emerge when children control a reasonably balanced and competent mastery

of the two languages" (p. 228). This is further supported by Genesee (2007) when comparing different types of bilingual education and the effectiveness of the program for different types of learners. He argues:

> In any case, these findings suggest that early immersion is more egalitarian than late immersion, since it appears to be equally effective for students with different levels of general academic ability. Overall, these results indicate that low academic/intellectual ability is no more of a handicap in FI than it is in English programs and that, to the contrary, low-performing students can experience a net benefit from immersion in the form of bilingual proficiency. (p. 660)

More and more is known about how thinking affects physical brain development, and studies are taking place about the impact of second-language acquisition on these functions. Rodriguez-Fournells, De Diego Balaguer, and Munte, (2006) in Executive Control in Bilingual Language Processing, explain that the brain builds neural networks that allow the segregation of the languages (the second-language from the mother tongue). This creates links that activate and inhibit vocabulary, patterns of word formation, and sentence structure. This coincides with the development of the ability to select words correctly and define their properties in either language (or in the one the speaker is currently using) (p. 134). This would seem to indicate that learners who are bilingual are forced to be more flexible thinkers, further supported by Bialystok (2001) when she states: "Therefore, what bilingual children are able to do is to inhibit attention to misleading information *of greater salience or complexity* than monolingual children can"(p. 214). Then it follows that children who are learning a second-language, becoming bilingual, are certainly able to respond to questioning, relate their thinking and problem-

solve with as much skill and expertise as their peers in monolingual learning situations, provided they have had the opportunity to learn the appropriate vocabulary. Paradis, Nicoladis and Genesee (2000) studied code-mixing and concluded that children: . . . have complex knowledge of how to fit their two languages together in one utterance during production, but also that they possess language-specific syntactic knowledge even during an early period of development… (p.259). Bialystok (2001) confirms this with her belief that children living in a bilingual world have developed a perspective that animates cognitive and linguistic skills while provoking their thinking on their view of the world and their social identity (p. 232). The conclusion can be drawn that learning a second language enhances learning, may make learners more flexible thinkers, and may provide them with skills that allow them to be better at defining problem-solving situations and choosing strategies or paths to follow.

Critical, complex and creative thinking. For 21st century learners it is essential to build in critical, complex and creative thinking (Rocky View Schools, 2011). Students are expected to relate their thinking, the process they used, and to ask and respond to questions. No longer is the simple acquisition of knowledge the focus of the learning taking place in the classroom. This was declared in Questioning a Path to Critical Thinking by Christenbury and Kelly (1983), "Thus critical thinking is the student's journey through ideas, not the teacher's journey, and the student's destination, not the teacher's" (p. 1).

Students need to be engaged in the questioning process. All too often the privilege of responding falls to the vocal few who have the confidence to speak out in front of the others. Shor and Freire (1987) drive home this point during their discussion: "Student

silence is created by the arts of domination. Students are not silent by nature. They have a great deal to say, but not in the script of the traditional classroom" (p. 30). Providing opportunities for learning through the teacher using skilful questioning strategies and the resulting dialogue needs to be available to all students, not just to those with the confidence, the ability to risk-take or those with better background knowledge. Adler (2001) tells us:

> The induction of learners into mathematical discourses, and to informal and formal spoken and written mathematics, is widely acknowledged as a complex affair. All learners come into the school with informal ways of talking which they can bring to bear on their mathematical learning. (p. 72)

This is further tied to teaching practice in the Alberta mathematics program of studies, which incorporates communication skills into the basic tenets of the program. Students are not just learning their second-language, but also the language of mathematics.

> Students need opportunities to read about, represent, view, write about, listen to and discuss mathematical ideas. These opportunities allow students to create links between their own language and ideas, and the formal language and symbols of mathematics. (Alberta Education p. 6)

With this emphasis on discussion and dialogue educators need to ensure they are not missing this important step in the learning process. When immersion students struggle to express themselves, they need encouragement, opportunities and time to formulate their thoughts into words. This is supported by the findings of Cormier and Turnbull (2009). They promote an integrated approach that combines the use of the language with the delivery of the subject content (p. 835), providing a simultaneous evolution of both

concept and growth in the use of language.

The importance of dialogue and discussion in the learning process of the student has not always been accepted as a productive use of class or teacher time. The exigencies of teaching the content-based objectives and meeting the needs of a variety of students who are at different stages of learning along with the need for evidence in the form of a tangible product are all reasons that have been used to avoid this type of learning. Adler stresses the importance of learning talk as part of the learning process. She maintains:

> An underlying assumption in all of the above is that learning talk, and particularly exploratory talk is part and parcel of the approach to teaching and learning in school classrooms. A further, related assumption is that the approach to knowledge, too, is exploratory. (p. 72)

In immersion classrooms, the issue becomes one of allowing students the chance to use their current vocabulary to formulate questions and participate in dialogue and discussion that truly reflects their thinking and knowledge. The deliberate and considered asking of relevant, thought-provoking questions should be a skill that is employed regularly. Allowing the learner to ask the questions and to inquire opens new thresholds both linguistically and academically, broadening the scope of learning that can take place. The teacher needs to seek new ways of understanding, new ways of imparting vocabulary and new methods of questioning, thus changing their role from dispensers of knowledge to facilitators of learning.

Technology. Today, having access to a multitude of technological tools is a fact of life for the North American child. Students use these tools for their own learning. No longer is the teacher the sole source of information in the classroom. This also applies in

the second-language classroom. There is access to an amazing variety of devices, programs, applications, and networks that can facilitate collaboration, dialogue and acquisition of knowledge. Larry Rosen (2010) informs us, "..the iGeneration children and teens are in elementary school, middle school and high school. They spend their days immersed in a "media diet", devouring entertainment, communication and any form of electronic media" (p. 2). Their understanding of communication and collaboration is based on the tools that are available to them. Rosen (ibid.) continues: "They blog, vlog (using videos to transmit information), Twitter, Facebook, MySpace, videochat, share photos, and latch on to and embrace any new communication tool and give it their own personal spin" (p.14). Students in French Immersion programs are no different than their peers in monolingual programs in this area. They are exposed to and use the same technological tools. Students can benefit in many ways from taking advantage of almost instantaneous connection to information and the world. They are no longer just connected to a stationary computer, but many have small, personal mobile devices that have many of the same advantages as stationary computers.

The change in how students see and connect to the world has made a difference in how they learn. They enjoy the social aspects of learning, using networks, wikis, blogs and podcasts to connect with their peers (Rosen, 2010, p. 48). Even students in elementary school have access to highly sophisticated mobile devices that they bring to school and expect to use. Rosen (2010) refers to this as Mobile Learning, or mLearning, where each student carries his or her own mLearning environment – a wireless mobile device (p. 59). He points out that mLearning is based on 5 important concepts:

1. Information is available anywhere there is internet access
2. Information is available anytime.
3. Information is available through devices that are becoming commonplace and will soon be affordable to most people.
4. Information can be "pushed" from the environment to the student and "pulled" by the student from the environment.
5. The learning environment is fluid and adapts as the learner learns. (pp. 60-61)

The use of mLearning, mobile devices, as well as regular exposure to a variety of technological tools and social media and networks has changed how younger students learn and see the world. Crocket, Jukes and McCain (2010) tell us: "They have developed what we call hypertext/hyperlinked minds. Their cognitive structures process information in a parallel or simultaneous manner, not sequential like ours" (p. 19). They continue to explain:

> Digital learners prefer receiving information quickly from multiple multi media sources, processing pictures, sounds, color, and video before text, random access to hyperlinked multimedia information, to network simultaneously with many others, learning "just in time", instant gratification with immediate and deferred rewards, learning that is relevant, active, instantly useful and fun, and digital learners prefer receiving information quickly from multiple multimedia sources. (pp.35-36)

The reality of today's students' learning situation is vastly different from that of their parents. The ever-changing influx of new technology necessitates innovation in the delivery of education, which will meet the demands of the principal clients, the learners. This influx of technology has also changed access to materials and to the world. Breck (2002) informs us: "As limitations of language are lessened (many knowledge resources are already available in multiple languages) and access to the Internet becomes universal, the singularity of scale pivots how we will learn" (p. 2).

What can be perceived as an ever-increasing rate of change in the growth of technological tools necessitates flexibility in how education is delivered. A skilful teacher, well aware of students' needs, does not rely on being the sole provider of access to information in the classroom. Today students have access to many sources of information and to a variety of learning tools, and are demanding to use all that is available to support and augment their learning. Howland, Jonassen and Marra (2012) make this clear when they state: "If schools are to foster meaningful learning, then the ways that technologies are used in schools must change from technology – as – teacher to technology – as – partner in the learning process" (p. 7). They further support this thought when they specify how technology should be used. "If technologies are used to foster meaningful learning, then they will not be used as delivery vehicles. Rather technologies should be used as engagers and facilitators of thinking" (Ibid). This change in how learning is delivered is very relevant in second-language classrooms. Through dialogue, in new formats, digitally, a whole new audience can be discovered with whom to share knowledge. Howland, Jonassen and Marra (2012) further illustrate this when they tell us that technology as a social medium can support learning through enhancing

collaborating with others, discussing, arguing and building consensus among members of a community, as well as supporting discourse among knowledge-building communities (p.8).

This ability to share, collaborate and to engage in discourse is exciting for learners and learning facilitators alike. It opens new doors for using a second-language and allows for differentiation in how learning can be undertaken and shared.

Collaboration. In order to facilitate second-language learning, dialogue and discussion must be an integral part of how learning takes place. This need to use the target language while building knowledge and higher thinking skills can be facilitated through the incorporation of collaboration as part of the lesson. This is not necessarily a natural process for some students, but one that must be taught, through modeling or with repeated opportunity to hone the skills. A teacher must consider the needs and abilities of the learners when planning for this type of learning and provide situations that lend themselves to collaboration. Tudge (1992) discusses the processes and consequences of peer collaboration. He realizes that in order for learning to take place, the ability and needs of the learners must be considered. He states: “The first is the "zone of proximal development"; for collaboration to lead to development, interactions should be within the less competent partner's zone of proximal development” (p. 1365). Students will need to take what they already know, have an opportunity to collaborate, and then apply that knowledge to something new, such as problem-solving. This can be done in a variety of learning situations, such as working with a partner, a small group or a whole-class discussion. Dacey and Bamford Lynch (2007) reinforce this method of learning when they recommend whole-class discussion and small-group work to provide opportunities to share ideas and talk about what has been learned. This then becomes the scaffold

which learners can use to build knowledge and skills (p.133). In the second-language classroom, the differing levels of vocabulary attainment, personal understanding of the task at hand, skills at problem-solving and the willingness to contribute their own personal experience help to build understanding, which can then be used by each individual. This is supported by Dacey and Bamford Lynch (2007) when they state . . . that individuals come to a task, problem, or conversation with their own subjective ways of making sense of it. If they then discuss their differing viewpoints, shared understanding may be attained (Ibid). This is commonly acknowledged by several, including Tudge (1992), . . . the intersubjective understanding gained in the course of collaboration becomes the child's own (though socially derived) subjective understanding, an understanding that incorporates the shared understanding previously established (p. 1366), and Swain, Brooks and Tocalli-Beller (2002) who state: . . . "activities which are external to the learner but in which he or she participates (interpsychological) are transformed into mental ones (intrapsychological)" (p. 172).

Collaborating is certainly an indispensable step in learning today. Collaborative opportunities serve to augment language acquisition but also to reinforce what the learner knows and to use this knowledge to build new understandings. Pellerin (2005) reinforces this idea:

> . . . collaboration should promote the exchange of ideas and thoughts, which would contribute to a higher level of thinking. The main goal of the collaborative process would differ somewhat from the cooperative process, in the fact that through communication, learners work together to understand a phenomenon rather than to find agreement. (p. 25)

It also provides the social aspect to learning, which the new generation of learners requires and uses in association with the technological tools available to them.

Curriculum and Dialogue. The mathematics program of studies in Alberta emphasizes the reliance on the ability to communicate effectively, so mathematics teachers are required to provide the opportunity for dialogue. The 2007 Alberta Education mathematics program of studies states: "Meaningful student discussions provide essential links among concrete, pictorial and symbolic representations of mathematical concepts" (p. 2). Taking this further, the mathematics program of studies highlights the importance of communication as it is considered an essential skill that is found throughout the program. In general, Alberta Education states the following: "Communication is important in clarifying, reinforcing and modifying ideas, attitudes and beliefs about mathematics. Students should be encouraged to use a variety of forms of communication while learning mathematics. Students also need to communicate their learning using mathematical terminology" (Alberta Education p. 6). Educators need to be asking themselves how to best encourage meaningful and engaged dialogue between the learners in their classrooms, with a deliberate focus on mathematics.

Ira Shor and Paulo Freire (1987) discuss the importance of the dialogical method of teaching. For Freire: "Dialogue is the moment where humans meet to reflect on reality as they make and remake it" (p. 13). In the second-language mathematics classroom, these moments contribute enormously to the understanding of the concepts. Not only are learners given the opportunity to use their new language, but also they use it to set limits, define approaches, debate strategies, argue, agree and confer. They ask each other questions, respond and negotiate to solidify their learning. Dialogue is a powerful learning tool, not only for language acquisition, concept or skill knowledge-building but also for learning how to interact socially and collaborate to learn and produce. Freire

deepens our understanding of the importance of dialogue by pointing out the difference between the giving of information and the creation of knowledge.

> Instead of this cordial gift of information to students, the object to be known mediates the two cognitive subjects. In other words, the object to be known is put on the table between the two subjects of knowing. They meet around it and through it for mutual inquiry (p.14).

Vygotsky (1962), in Thought and Language, stated that dialogue and communication were important in the formulation of the thinker. He quoted Tolstoy when he stated:

> As Tolstoy noted, those who are accustomed to solitary, independent thinking do not easily grasp another's thoughts and are very partial to their own; but people in close contact apprehend one another's complicated meanings by "laconic and clear" communication in the fewest words (p. 125).

The implementation of dialogic style learning opportunities must be carefully planned and implemented. Dialogue - the give and take of questioning and responding, discussion and conversation - is part of the historical nature of human beings (Shor, Freire, 1987). Freire emphasizes the point that when the teacher begins the dialogue, "he or she knows a great deal, first in terms of knowledge and in terms of the horizon he or she wants to get to" (p. 17). This supports the need for consideration of the culture of the classroom and the formulation of questions designed to draw out the thinking of the students. Shor and Freire talk of "verbal texture" - the many modes found in the voices of humans; these are comprised of questions, statements, generalizations, specifics, images, comedy, pathos, sarcasm, mimicry and sentimentality (p. 29). A teacher cannot

assume that this will occur naturally, as the nature of the learning must lend itself to collaboration and discussion. The role of the teacher necessarily changes from that of the provider of information to that of facilitator of dialogue, thus empowering students to build their knowledge together with one another and in collaboration with the teacher.

Questioning. In light of this empowerment through dialogue, the interaction of questioning and responding and working collaboratively is an integral part of the language acquisition and learning process that must be deliberately engaged, dialogically, in the classroom setting. Children need to explore their thoughts and reasoning through discussion. Teachers can encourage discussion through the use of open-ended questions and allowing students time to reflect, consult and question each other. Cecil (1995) points out:

> Habit is another block to the free flow of questions and answers in the classroom. …. An example of this is when teachers ask all the questions (especially as indicated in the teacher's manual), instead of allowing children to ask their own questions and to answer one another's questions (pp. 20-21).

The use of a variety of learning situations such as small group work, large group work or partner learning can open up the opportunity for students to express themselves with more confidence as well as providing more class time where these opportunities arise. In the second-language immersion classroom, the question of language acquisition again arises. What does the questioner need to know before asking the question? Fiengo (2007) in Asking Questions: Using Meaningful Structures to Imply Ignorance, tells us that a speaker must have enough of a grasp of the language to understand the grammar of it. That includes being able to choose the proper sentence type and knowing how to use

it. Further, the speaker will have beliefs about the relationship between what they are talking about and the language used (p. 158). The idea of doubt is also important. Students, to be interested enough to pursue an inquiry, must have some doubt or an unknown that piques their interest. Bruin (2001) sums this up by noting the interconnectedness of doubt and questioning: "Questioning and doubting are not identical, but they are closely related. Doubting is multi-directional, as is questioning. And not surprisingly, doubting also gives way to questioning" (p. 47).

The importance of questioning cannot be understated. In order to build in thinking, communication and language skills, provide meaningful discussions, encourage risk-taking and develop questioning and theorizing skills, clear attention must be paid to using a variety of questioning strategies and in a variety of circumstances. In Activating and Engaging Habits of Mind, (Costa and Kallick, 2000, pp. 34- 35) the authors assert that all questioning should focus on drawing students into the learning process. In order to accomplish this, they recommend being very aware of current questioning practice and limiting certain types of questions. Questions to be limited include: verification questions, closed questions, rhetorical questions, defensive questions and agreement questions. They state that: "Questions invite different levels and complexity of thinking . . . Teachers will want to use linguistic tools deliberately to engage and challenge complex thinking" (Costa, Kallick 2008 p. 138). Costa and Kallick (2008) propose using questions at three levels of thinking. The first level is comprised of Input, the second level, Process, and the third level, Output. Each level has different types of questions. In the first level, Input, questions include those for gathering data, used to draw from students the concepts, information, feelings, or experiences acquired in the past and

stored in short or long-term memory (p. 138). As part of the second level, processing, the teacher facilitates synthesizing, analyzing, summarizing, comparing, contrasting or classifying. These types of questions lead students to true inquiry and to raise further questions leading to further research (ibid. pp. 140-141). The third level, output, uses questioning as a tool for going beyond the concept and using it in a new situation. Students are required to think creatively, use imagination, expose or make judgements. Answers cannot be typically found in a book or other sources (ibid. pp. 141-142). According to Walsh and Sattes (2005), all questioning should be carefully planned and formulated in advance to be the most effective. They suggest instructional purpose, content focus, cognitive level, wording and syntax, and reflecting on related beliefs as key points in the formulation process (pp. 49-50). In the French Immersion classroom, this process of careful planning and forethought increases in importance, as students are communicating in their second-language. Careful thought will need to be given to the level of spoken vocabulary, familiarity with mathematics vocabulary and the syntax of the question as well as the other factors of cognitive level and content focus.

Conclusion. By providing a variety of learning situations, supported by dialogue and technology, a teacher will certainly be considering the learning needs of the individual. When the teacher begins to appreciate the importance of skilful questioning as a way of knowing how children relate their thinking process in a second language, they have started a process of perceiving how children learn. When taken a step further, by expecting the learners to question, a whole new understanding can take place. Through asking skilful and thoughtful questions, both learners and those who facilitate learning will assist in building knowledge but also in building learning communities. Today's

second-language learners, even at the elementary grades, need frequent, well-planned opportunities to be able to respond to well thought-out questions with confidence, opening a window onto what they know and how to express that knowledge. Collaboration and technology can also provide vehicles for communication in the second-language classroom. When the reason for communication is authentic and necessary, learners will find the means to transmit their message. Howland, Jonassen and Marra (2012) support this train of thought.

> Throughout history, people have found ways to communicate with each other to support community goals and activities; they have overcome obstacles and used considerable ingenuity in doing so. From preliterate cultures to today's media saturated society, individuals have invented and utilized technologies to support that communication. (p. 132)

The myriad of factors which impact communication, second-language acquisition and response to questioning, can be considered so as to enhance both learning and the understanding of learning. This is the role of the teacher today, to provide opportunities for communication, sharing learning and building learning communities.

Research and Methodology

Question

How does language competency influence learner response to questioning in mathematics, in the context of the early french immersion classroom?

Rationale

It is important to reflect on why this question has remained a focus for the researcher. As early as 2005 -2007, I was working with the Rocky View Schools Math Coaching Cohort on the implementation of the new mathematics curriculum. All of the others involved were teachers who taught in the regular English program and didn't have to deal with students in a second-language immersion program. If they had second-language students, they were ESL students, who were in most cases being pulled out of the regular classroom for support in English language learning. My questions about how second-language immersion students were able to respond to questioning in a second-language went unanswered. These questions began to impinge further on my thinking during conversations with colleagues at school. Many of the French Immersion teachers at my school were telling me that Immersion students were not able to express their thinking about learning or problem-solving as they didn't have the vocabulary to do so. Whether or not this was resistance to a new curriculum or based on their actual experience with students was forefront in my mind as I continued to encourage my students to try this new way of learning math. In fact, this seemed to be true as I was starting to change the focus of my lessons in math from using one standard method of problem-solving to accepting a variety of strategies or methods to get to an answer. Students were capable of finding their own mathematically acceptable strategies for

problem-solving, but when I asked why they chose that strategy, shoulders were shrugged. They would state that it was just in their head or that they didn't know. I found this frustrating because I knew that the new curriculum had a strong focus on being able to verbalize learning and sharing with other students. My journal reflects my own desire to figure out the problem. I was raising a number of questions related to this: Is it a lack of vocabulary related to the subject? Are students unable to formulate complex thoughts/responses in their second-language? Could it be a lack of understanding of the subject area and/or an inability to apply understanding to the situation? My puzzlement continued as I wondered about the actual words I was using; Were my questions of such poor quality that they did not elicit higher thinking skills? How could I encourage my students to use those higher thinking skills and then tell me how they were learning and what they were thinking. I wondered how I would know when students were actually able to verbalize their thought processes? Was it due to the type of question and not to other factors?

This also led to some heart-felt self-questioning about how a skilful question interacted with the acquisition of a second language. Does the lack of vocabulary limit the depth and scope of an answer? If a student is capable of verbalizing their method and their response, does it truly reflect their understanding or is that understanding limited by the narrowness of their vocabulary?

Could I truly encourage my students to take apart their own learning, talk about it with their peers, use others' ideas to augment what they knew and then put it all to use?

Research context

The research project took place at Elbow Valley Elementary School. It is a rural school, located in Springbank, on the western outskirts of Calgary, Alberta. Elbow Valley Elementary is a dual track school with Kindergarten to grade four programs in both French Immersion and the regular English language-based program.

Participants. In the target classroom, there were 22 students, 21 of whom participated in the project. There were a range of abilities within the classroom, including a student on an individualized program plan, others who were participating in programming that provided extra challenges and students who were receiving extra support for reading in French. Students were from a range of social and ethnic backgrounds, with most living in the adjacent rural area, Springbank. Several students in the class were from the west side of Calgary, Alberta. All were speakers of English as their mother tongue. Eleven of the student participants were male and ten were female.

Setting. A collaborative setting was organized and collaboration highly encouraged across the curriculum. Students were encouraged to work together and to discuss things with and assist each other. They were grouped in a variety of learning situations. These groups were flexible and changed when requested or needed. In some situations, groupings were deliberate, in order to enhance learning, to eliminate friction between students or to eliminate undesirable behaviour. The classroom itself was physically set up to encourage this collaboration. Desks were placed in flexible groupings of four to six. These groups were placed around the classroom in areas that would encourage mingling and exchanges between the groups. Students were encouraged to move their desks if the need arose and to move freely about the room. As

mathematics was the target of this research project and the researcher was interested in the dynamics of question and response, students worked regularly in groups of two, three and four throughout the academic year. These groupings varied in nature, sometimes heterogeneous in regards to ability, gender and nature of the students. At other times, more homogeneous groupings were used, again in regard to ability, gender and nature and preference of the students.

Students were engaged regularly in inquiry projects. These took place across the curriculum. They completed projects in French and English Language Arts, Science, Social studies and Math. These were usually collaborative in nature, but may have required individual work that was submitted as a culmination of the project.

Methodology

The project used a qualitative research model, an action research approach to investigate systematically the purposeful use of questioning to encourage higher level thinking in a second-language. A four-step, cycling, action research process was used. This followed the action research model presented by Margaret Riel (2010) on the website for the Centre for Collaborative Action Research. This included: planning, action, collecting and analyzing data and reflecting, in each cycle. Each cycle included documenting student response to questioning both by the teacher and each other through the use of videotaping as suggested by Martine Pellerin (2011) in AISI (p.2). The cyclical nature of action research provided opportunity to reflect upon the collection of data, rethink and plan for greater understanding and advancement in practice (ibid).

Data collection.

- Video recordings of classroom interactions
- Samples of student work related to video recordings
- Interviews (individual and focus group) with students (students are not identified)
- Surveys (individual and focus group) of students

Analysis of data.

- The video recordings served as a record of what took place between students and teacher while the research was taking place. All research related to the collection of data, recorded on the data form was drawn from these videos. They allowed the researcher to accurately recall and record interactions that took place.
- The samples of student work were photographed and descriptions of the tasks are included as support documentation relating directly to the interactions taking place within the classroom and recorded on videotape. These served to highlight key points in a student's ability to respond to questioning about their thinking process.
- Interviews with students were used to document the students' feelings about their situation before, during and after they responded. The surveys also served to question students about the vocabulary they understood in hearing the question and used in the process of producing a verbal

- response. Students were also asked to observe themselves on the videotape.
- Students were surveyed to document their feelings when questioned. These results have been collated. This survey dealt with such issues as student risk-taking, nervousness, confidence and whether or not students knew how they found the response.
- Description of final product.

The researcher regularly videotaped a series of math classes, analyzed selected sections of video and used this information as the basis for this project allowing for a response to the research question. From the videotapes data was extracted, looking at the types of question words used and the frequency they were used. Student responses were recorded and collated. Information from interviews with students and from the student surveys was used to support and extend the data that has been taken from the videotaping of lessons. Mixed methods were used to triangulate results, so that three different sources of data, both qualitative and quantitative, informed the research.

What does it mean in the classroom?

The evidence gathered through this study lead to an awareness of more effective questioning strategies, both for students and educator. The methodical planning and implementation of a variety of questions, at different cognitive levels, was key in gaining more complex responses and in encouraging higher level thinking skills. It served to answer the question of whether or not second-language students could use higher level questioning strategies, while engaged in math problem-solving activities, to increase the

complexity of responses. Language acquisition impacts the students' ability to respond to questioning, ability to recount the process they used and the ability to talk about their own thinking. The study shows that when questions are purposefully and carefully asked, students' growth in their ability to answer higher level questions will be commensurate with their maturity, the instruction they received, modeling of how to respond and the further development of their second-language skills. Students also found ways to express their thinking, even when lacking the specific vocabulary required. The teacher –researcher has further insight into instructional strategies that could be used to engage students in higher level thinking and questioning, enhancing learning and the development of the whole child.

Analysis of the Data

Analysis of Tasks

The tasks that were assigned to the students and then videotaped were specifically chosen because of their collaborative nature. This type of problem allowed and encouraged dialogue, lending itself to discussion and questioning among learners and among learners and teacher. The collaborative, dialogic nature of the problems allowed for a variety of strategies that could lead to solution. Since the inquiry took place during the months of May and June, the focus was on the strand of Shape and Space from the Alberta Mathematics Grade Four French Immersion curriculum, but activities from the number strand from the same curriculum were also used.

The tasks were analyzed through the use of video clips that recorded the interactions between students and how they responded verbally and physically. Sections of video were observed and analyzed. The dialogue was transcribed, reflecting actual statements by the students without correcting grammar or anglicisms and physical reactions were recorded. The researcher observed classroom interactions for the use of vocabulary appropriate to the subject, actions or body language that signified understanding, ability or inability to explain strategies used and grammatical formulation of student response that made sense. The sections of video used were transcribed onto a spreadsheet. See Appendix 1. The criteria used in the analysis were as follows:

Physical Response

- Able to write, draw or physically indicate mathematical strategy
- Able to indicate a positive or negative response

French Language

- Responses use mathematically appropriate vocabulary
- Responses are grammatically appropriate
- Able to explain the steps used in a strategy
- Able to make a judgment about the efficacy of a strategy
- Able to apply the strategy to a new situation or problem

Analysis of the Survey

Students were surveyed to gain an understanding of how they felt about questions and being questioned during mathematics class. The survey allowed them to respond anonymously through the use of Survey Monkey, an online survey website. The questions in the survey focused on the feelings of the students. They were asked about how they felt about answering questions in autonomous and collaborative situations, how they decided on questions to ask, whether or not they felt others listened to them, and their confidence in asking and responding to questions. The responses to the questions were tallied and presented through the use of percentage to show how many responded to each possible answer. The information from the survey was used to determine student comfort and confidence in responding to questions and questioning.

Analysis of the Interview

Interviews were analyzed to gain understanding of the metacognitive process of the learners and the depth of understanding they had about the role of questioning in their own learning. Their responses to the questions were digitally recorded and used to further the researcher's understanding of how grade four students respond to questions

and questioning, the depth of their understanding of the importance of questions and questioning and their comfort and confidence levels in responding to questions autonomously and collaboratively.

Results and Reflection

Interactions were transcribed into tables to illustrate the question and response. Each interaction is accompanied with reflection by the teacher/researcher as part of the action research cycle.

Estimating numbers task. The following interaction took place during an activity to estimate number. Students were given boxes of the candy, Smarties, and asked to estimate the number in a small box. They were then asked to use what they knew about the number in a small box to estimate how many Smarties would be found in progressively larger packages. This activity is used to introduce students to estimating, designed to both inspire them and build confidence. The students eventually worked up to estimating packages that would contain hundreds of Smarties. One student had organized her Smarties by colour; even though the colour was not going to impact her estimate of how many Smarties would be found in the next larger size of package. She was reluctant to explain why she had done this and only responded with “parce que” or because.

Table 1. *Interchange from the Estimating Number Task*

Question asked	Physical Response	Verbal Response
Pourquoi as-tu mis en couleurs différentes?	Continues sorting	parce que
Beth?		11
Beth tu en as 12?		9, 10, 11,…11
Tu en avais combien dans ta boite?	Continues addition (about 5- second response time)	Il y a 45.

Eventually she counts her Smarties, adds them four times and estimates that there would be about 45 Smarties in the larger box. In this interaction the student has not shared her thinking, has not interacted with her group members and has perhaps missed out on an opportunity to confirm or extend her understanding. Her response does show that she knows the numbers, can verbalize number words (which are expected in grade one, and she is a grade four student), but she has taken very little risk in terms of speaking French. She has used simple multi-word answers and does not use a sentence until her last response, which, in considering complexity, was a very simple response that may be expected of a much younger student.

Figure 1. Students counting Smarties for the estimating number task.

Ordering time task. In the following sequence, the task asks students to order time using hours and minutes. They created three different ways of writing out the hours and minutes they chose and then were asked to place themselves in order from the earliest to the latest. Several students contributed to the discussion, as they physically moved from place to place, putting themselves in order.

Table 2. *Interchange from the Ordering Time Task*

Question asked	Physical Response	Verbal Response
Student: Qu'est-ce que tu es?		Je suis quatre heures vingt-cinq.
Qu'est-ce que tu es?		20
Qu'est-ce que tu es?		
Quelle heure es-tu?		
Teacher: 3:30? Tu vas partir à 3:30? Est-ce que tu es à la bonne place? Ici il est cinq heures.	Nods head	ummmmm
Student: Quelle heure?	Student repeats this question multiple times to find his correct spot in the line up of hours.	

This type of questioning between students did not appear to elicit in-depth responses, as there were very few verbal interactions. However, students were physically moving themselves to the appropriate spaces in the line. A non-verbal negotiation was taking place, where most students looked at the hour written on the card and placed themselves accordingly. The first student in the interaction went actively down the line asking for the time and moved on quickly as students responded briefly or by showing their cards. It is notable that only one student actually used the proper vocabulary to ask the question, and only one responded by telling the time in an acceptable manner. The teacher stepped in at one point to assist a student through the use of questioning and deliberately not telling the student they had made an error and that they were in the

wrong spot. That student then made a judgment, decided on his/her own to move and found the correct spot using the strategy of asking an abbreviated question, “Quelle heure?” multiple times.

Figure 2. Student comparing time with other students for the ordering time task.

The type of activity influences the level and manner of participation on the part of the students. In this lesson, students had time in their groups to discuss and choose times to return from the shopping mall. The next step in the lesson was to place themselves in chronological order, changing their discourse from one of collaboration on choosing a relevant time to reduced verbal interaction and more emphasis on physically placing themselves correctly. Their responses became limited to a minimal amount of words, when physical indication or using visual cues would suffice.

Problem-solving with calendars task. Students are required to problem-solve using calendars as part of the grade four mathematics curriculum. In this exchange, a student has created her own calendar using an example on the white board as a reference. She also used the calendar application on her iPod to verify that she was creating an accurate calendar. This was particularly remarkable as this student regularly resisted collaborating with others to assist in her own learning. She often stated that she preferred to work alone.

Table 3. *Interchange from the Problem-solving with Calendars Task*

Question asked by the teacher	Physical Response	Verbal Response
Comme ça Sally, qu'est-ce que tu fais?		Oh, je découpe les nombres et après je vais les mettre…
Comment tu vas les mettre en ordre?		Juste pour vérifier, je suis allé sur mon iPod.
Et qu'est-ce que tu as trouvé?		Que le 2 mars est sur le samedi.
Le 2 mars est le samedi?		Oui, dans le mois de deux mille douze.
Mais je remarque que tu utilises un calendrier en anglais. Est-ce que ça va faire une différence si tu fais un calendrier en français?		Un petit peu…
Comme ça, comment?	Student indicates place on her work.	En anglais, le dimanche ça va être ici et…mais en français le dimanche va être là.

This student was clearly able to explain her process and the difference between the English calendar and the French calendar. However, she didn't have a clear personal strategy for placing the dates on the calendar other than using her iPod to verify that the numbers were placed in the correct spots. She did understand that English calendars were different than French calendars, physically indicating the difference in the placement of Sunday or dimanche on the calendar, while explaining what she was doing verbally.

Figure 3. Student preparing a personal calendar for the calendars task.

The student in the exchange below had difficulty expressing his process and strategy for filling out his calendar with his important dates. Even with repeated questioning and rephrasing of the question, his responses were incomplete sentences. This student lagged in his verbal French skills and that is reflected in his verbal responses. In this situation, he had removed himself from his group and was working on his own, even though he had a partner to complete his calendar, not allowing himself to benefit from the collaboration of his peers.

Table 4. *2nd Interchange from Problem-solving with Calendars Task*

Question asked by the teacher	Physical Response	Verbal Response
C'est quelle journée de la semaine? Est-ce que c'est lundi, mardi, mercredi, jeudi…?		Je pense que c'est un…lundi.
Comment vas-tu être capable de trouver quel jour de la semaine que c'est?	indicates place on calendar	ummm uhhh je mettre comme 26, 25,
Est-ce que tu es certaine que c'est la bonne place de mettre ça?		Oui.
Comment tu sais ça?	Physically counts places on calendar	Parce que c'est juillet et ça commence là, 2, 3, 4, 5, 6, 7
Comment tu sais ça?	Points to white board	là
C'est quoi là?		ou, au le tableau, tableau
C'est quoi au tableau?		le calendrier
De quelle année?		de 2012.

Figure 4. Student preparing personal calendar for the calendars task.

The student in this case, working on the same calendar problem, has worked with her group and discussed the problem as they completed their calendars. She has placed most of the dates on her calendar and is able to relate confidently which day is her special day, other significant days of that month, how she figured out how many days were in the month and which day of the week her special day was. She initially made an error about which day of the week, which she self-corrected upon further questioning.

Table 5. *3rd Interchange from Problem-solving with Calendars Task*

Question asked by the teacher	Physical Response	Verbal Response
Mary, explique à Mme ce que tu fais pour ton calendrier		Ma jour special c'est le 27 mai. Parce que c'est ma fête et c'est sur un samedi. Le premier mai commence sur un mardi, il y a 31 jours dans mai.
Comment tu savais qu'il y avait 31 jours dans le mois de mai?		Je regarde sur le calendrier, mais je faut regarde encore. Oui, c'est 31.
Ok et quel jour de la semaine est ta fête?		C'est dimanche.
C'est dimanche? Comment tu savais ça?		Parce que c'est dans 2 jours!

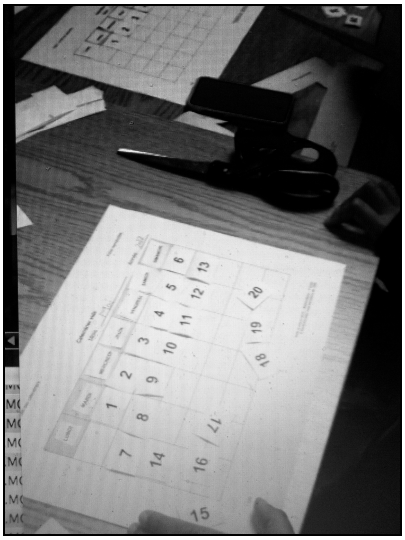

Figure 5. Student preparing personal calendar for the calendars task.

Constructing nets task. As part of the Shape and Space unit, students were asked to construct nets for right rectangular and triangular prisms. They were given a number of shapes, squares, rectangles and triangles. They had to roll a die and then choose their shapes according to the number rolled. The amount of time to construct the prisms was limited and each member of the group had to build as many nets as possible.

Table 6. *Interchange from Constructing Nets Task*

Question asked by the student	Physical Response	Verbal Response
Qu'est-ce que tu as fais?		Oui j'ai roulé un.
Qu'est-ce que tu as roulé?		J'ai fais trois des 2, les mauve choses, et umm, comme trois des rectangles, et deux de les triangles, petits triangles et j'ai mis ensemble oui.
K Est-ce que c'est mon tour de rouler?		Oui.

Figure 6. Students participating in the constructing nets task.

Students involved in this activity were focused on the immediate need to understand what each one was doing and their turn in rolling the die. Their questions and responses necessarily were concerned with the number that they rolled and if they could proceed with their turn. Even so, one student explained his process, an afterthought, first answering the question in another manner. Initially he interprets the question as asking which number he rolled and then he realizes that he may have been asked about what he has built with the shapes and proceeds to tell which shapes he used and put together. Even when he is unsure of the vocabulary he uses general terms in replacement of the specific vocabulary.

The next interaction is taken from the same activity. Students in this case were concerned specifically with verifying that it was indeed their turn and what other students had rolled on the die. As the activity called for making the most 3-D shapes possible,

they were also letting their group members know how many 3-D shapes were already made.

Table 7. *2nd Interchange from the Constructing Nets Task*

Question asked by the student	Physical Response	Verbal Response
Est-ce que tu es allé pour moi quand c'était ma tourne?	No response	
Est-ce que c'est mon tour?		Oui.
5		5 est le triangle
6, où est le 6?		Oh! J'ai quatres formes!
Qui a 4 formes ici?		Oh oui, je peux faire, j'ai 4 formes.

Quick draw task. Quick Draw, Developing Spatial Sense in Mathematics (Wheatley, 2007) is an image-based mathematics activity that was used to encourage spatial reasoning during the shape and space unit on 2-D and 3-D shapes. Wheatley (2012) tells us that students who are able to reason from images are usually strong mathematics students. Integral to the activity is the discussion component where students are asked to explain what they saw and how they drew it. Grayson Wheatley tells us that this is a crucial component of the activity. "The whole class discussion of Quick Draw figures helps students get comfortable explaining their thinking to the class." (Wheatley 2012) In this interaction, a third student is explaining how her approach to the drawing is different from those of her peers who preceded her in explaining themselves.

Table 8. *Interchange from the Quick Draw Task*

Question asked by the teacher	Physical Response	Verbal Response
On a entendu la façon que Bennett a fait, on a entendu la façon que Colin a fait, est-ce qu'il y a quelqu'un qui a fait quelque chose de différent?		J'ai fait un petit changement, parce que
		J'ai fait un grand rectangle, puis un petit rectangle dans le milieu puis un ligne ce…de le coin
		Puis après j'ai fait un rectangle un petit peu comme….diagonale….en bas et après j'ai fait un carré.
Qu'est-ce que tu as vu quand tu as regardé premièrement, qu'est-ce que tu as pensé quand tu l'as vu?	student uses finger to trace shape on the white board that she first noticed.	La première fois? Ummm je pense juste comme ça.

In the next interaction, the student explains in depth what she saw and how she drew it. She uses physical action to indicate the direction of her line, supported by her verbal explanation. This she used in place of specific vocabulary, perhaps unsure of the word to use. Her physical indication effectively conveyed her message.

Table 9. *2nd Interchange from the Quick Draw Task*

Question asked by the teacher	Physical Response	Verbal Response
Qu'est-ce que tu as vu?		J'ai vu comme cette partie, c'est comme un livre presque, comme tu peux le fermer.
Comment as-tu dessiné, Jade?	Student is describing a line she drew on an angle and not horizontal on the page	J'ai dessiné pour faire un carré et j'ai fait ma ligne, c'est ici, c'était comme… pas là.
C'est comme un lozenge un peu oui?		La première fois j'ai oublié cette partie mais la deuxième fois je l'ai vu et je savais que c'était comme un triangle.

Attribute task. The following activity required students to observe a number of shapes and make judgments about why they were contained in a certain set. In all the cases, the shapes were similar and had many similar attributes, making it important for students to look beyond the number of corners and sides. The activity generated animated discussions amongst group members. Many students remained focused on the number of sides and corners, even though this was a common attribute repeated throughout the lesson. Others began to look at each side and corner, searching for further reasons to include them in or eliminate them from the set. The conversations were animated during the group activity, and were followed by a whole class discussion that reinforced the learning taking place. Both types of conversation were necessary for students to solidify their thinking.

Table 10. *Interchange from the Attribute Task*

Question asked by the teacher	Physical Response	Verbal Response
C'est vrai que c'est tous les diamants dans la première rangée, mais qu'est-ce qu'il y a qui est spécial avec les diamants? Pourquoi ils sont spéciaux?	Student indicates narrow angle with hands.	C'est presque comme un carré mais c'est comme très…
Pourquoi c'est différent que les carrés et les rectangles dans les autres rangées?	Student indicates turning square with hands.	Parce que …c'est dif…pourquoi les diamants sont spéciale? Ahhh ils sont spéciales parce que tu peux prendre un carré et fais dans un façon et ça c'est comme un diamant.
ok, mais quelque chose d'autre aussi.	appears to be counting sides or corners	C'est différent d'un rectangle parce qu'il y a comme 1, 2, 3, 4
		Uhhhh je trouve!!!
		J'ai trouve, j'ai trouve!!!
		Tous les lignes ici, toutes les lignes qu'il a, ont les mêmes sides.
Ils sont de la même longueur?		Oui! même longueur! Toutes les lignes. Regarde!
		et dans un rectangle toutes les lignes sont juste un cas.
Peut-être ça c'est quelque chose, c'est une chose à penser, qu'est-ce que tu as pensé Sara?		Comme les triangles ont trois sommets et les carrés ont quatre.

In the above case the student suddenly realizes that the length of sides may impact why shapes have been placed in a set. These students continued to work on and look at the exterior portion of the shape, focusing on length of the sides and corners. The teacher continued to question them, hoping to point their inquiry towards the interior of the shapes and the size of the angles within each shape. These students were able to focus on the orientation of the shape, size and number of corners.

Properties of shapes and forms tasks. Students in the following two activities were asked to use shapes or forms and either categorize them or build another object with them. It should be noted that the students in both cases persevered in their thinking and verbal explanations even when they were not sure of the vocabulary. Both activities centered on the properties of shapes and forms. The first activity looking at a 2-D shape and the second building a 3-D form using plastic shapes that could be joined together.

Table 11. *Interchange from the Properties of Shapes and Forms Task*

Question asked by the teacher	Physical Response	Verbal Response
Qu'est-ce que tu as pensé?		et les uns sur cette coté, pas juste tourné pour être comme un …
		zange, un olzange.
mmmhmmm, ok autre… le groupe…		oh j'ai autre
un autre chose?		et il a un qui regarde comme un elange,
lozenge,	student goes to board and indicates 2 shorter sides compared to 2 longer sides.	lozenge, mais ce n'est pas un zozenge, parce que cet coté a un plus petit et plus petit que cet coté.

Table 12. *2nd Interchange from the Properties of Shapes and Forms Task*

Question asked	Physical Response	Verbal Response
Anthony, peux-tu me dire, qu'est-ce que tu es en train de faire?		Je suis en train de voir si je peux faire une petite balle comme le comme avec pas de, comme c'était, comme avec, quatre coins
Comme ça quelles sortes de formes est-ce que tu utilises?		J'utilisais les um triangles, les carrés, les rectangles, et un peu comme ça.
Qu'est-ce que ça s'est appelé?	teacher indicates a pentagon student counts sides. student taps head	Un seconde..si ça….C'est comme un ummm ummm,

Table 13. *Continuing the 2nd Interchange from the Properties of Shapes and Forms Task*

Penta?….	teacher cues	Pentagone!
De combien de pentagones penses-tu que tu as besoin d'utiliser pour faire un ballon?		Un grand ballon ou l'un que je suis en train de faire?
L'un que tu es en train de faire.		K. Est-ce que je peux estimer?
Mmmhmmm.	student uses pentagon to measure around another pentagon, counting the number he thinks he will need.	Huit.
Tu penses que ça va en prendre huit?		Oui.
Ça va être quelle sorte de ballon?	student indicates partial ball form he is holding	Juste un petit un. Comme ça, mais Sophie a utilisé toutes les un comme ça. Comme ça je ne peux pas faire.
Est-ce qu'il y a une meilleure façon de faire ce ballon?	student first indicates a hexagon and then a triangle	Avec ces sortes de formes, parce que tu ne peux pas faire un ballon avec ces.
Oh tu me dis que tu ne peux pas utiliser un triangle pour faire un ballon?		non parce que c'était pointu.

Both of the above students were actively engaged in the activity they were completing. They had a vested interest in the activity and were each compelled by that engagement to persevere with the activity even though they were lacking some of the key vocabulary. They found other ways to pronounce a word or they used physical representation by finding an object that showed what they meant. In this way they were able to communicate their thinking, even without the proper vocabulary. In this way, the

other learners or the teacher can then supply the necessary vocabulary, in context, and the dialogue continues in a natural fashion.

Survey. The survey questions were answered individually by students who were online using the website Survey Monkey. Their responses were then automatically collated by the website. In question four respondents could choose more than one answer. The results of the survey are included as Appendix 1. In general, most students felt comfortable answering questions in class or in small groups. The majority also felt they knew an answer before answering. It was intriguing to see that many students felt that when working, in a small group, the other members of the group did not necessarily listen to their questions. When students left comments they indicated that they did not feel pressure to answer questions and felt they could trust the teacher. Students did feel peer pressure when working in small groups and some worried about fitting in with certain peer groups. Others expressed that working in a small group suited them much better than working in large or whole class groups. Students also stated in the comments that when a question was not understood, they felt good about asking a friend. The student responses point out the importance of trust, building of confidence and an atmosphere of safety.

The varied responses, differing levels of confidence and points of view from both ends of the spectrum indicate the necessity of the individualizing programming and questioning. Teachers need to consider allowing a number of different situations for questioning and learning to provide all students the opportunity to ask and to respond to questions.

Comments from the survey. The responses below have been transcribed as written by the students. Corrections to spelling and grammar have not been made.

Question 1. How did you feel answering questions in class?

“I trust Madame and I feel safe in the class when I help her.” “Beacause I feel comfortable with Mme Pothier as a teacher.” “I felt confident.” “Because the teachers don't force you like yell at you.” “Because my teacher didn't make me fell nervous.” “Beacause my techer didint persure me.”

Question 2. When you are asked a question, do you feel like you know the answer?

“Madame explains subjects and what we're doing well, but sometimes it's a little hard for me to understand.” “I do not know all the answers and I think I am not the best at school.” “Because my teacher explains well.” “I try to think but somebody beats me too it.” “Sometimes I haven't learned the answer yet or another student has found the answer before me.” “I think because the teacher teach us very well.”

Question 3. How do you feel answering questions in a small group?

“Sometimes the people I'm in a group with aren't people I know very well or they are very popular and sometimes I feel embarrassed.” “If I'm with my friends I'm comfortable because I can trust them.” “But I'm still comfortable with others.” “Because my class is very good.” “My group listens to me.” “Well it's hard to explain... I just feel more comfortal in a small group.” “Because it is not a whole big group of people staring at you.” “Beacause every body respects me.” “Because everybody works together.”

Question 4. How did you decide which questions to ask in your group?

“I had lots of questions about fractions, but I also tried to help my group as much as I could.” “By the subject.” “We thought about questions then decided which ones to do.” “I get confused.”

Question 5. Do you understand the questions that are asked in class?

“Sometimes there are French words are I little confusing.” “Usually I understand mme's questions but if I do not I ask my friends about it.” “Because their clear.” “Some of the time I do, it kind of depends of what the subject is and what were trying to learn.” “But I usually do.” “Sometimes I just really don't understand.” “And if I didn't I asked a friend.”

Question 6. I feel like my group listens to my questions.

“In my group, I'm not very noticable.” “Sometimes I have questions, but they don't get answered.” “Usually my group has better question than I do so mine don't get used most of the time.” “Only if it's a small group.” “I feel like they do sometimes because if they don’t understand they probably try to listen to me so they can understand a little bit more.” “Sometimes they want to say their idea too but I'm okay with it.”

Question 7. I feel like the class listens to my questions.

“Some boys don't listen (understandable) but some girls don't either.” “Because I watch them. All the time.....”

Question 8. I feel like my answers are to and accepted in my group.

“My questions aren't always answered.” “Usually my group has better question than I do so mine don't get used most of the time.” “If there the right awnser.” “I do because if the question is hard they can get something out of it.”

Question 9. I feel like my answers are listened to and accepted by the class.

"Because we all usually agree." "If I get the question."

Question 10. I feel more confident now answering questions in class than I did when I started grade 4.

"Well this is my first year at this school and some people made me feel comfortable. So now I feel rely comfortable." "Yes, beacose I was shy." "I do think I've improved I little bit since the beginning of the year."

The necessity of providing an open and accepting classroom atmosphere is made evident through the responses and comments in the survey. Students need to feel a sense of acceptance and of self-confidence to be ale to express themselves without fear. In order to encourage risk-taking, they have to know that they can make mistakes, discuss it and change their thinking and move in a new direction without repercussion. A variety of questioning situations, including small group and partner work, must be provided to give all types of learners the opportunity to respond. The question becomes one of how to reach those students who, inherently and given their nature, lack the confidence to embark in discussion or dialogue through fear of making a mistake or being judged.

Interview responses. The interviews took place between the teacher researcher and small groups of students. The interview was casual in nature and not every student answered every question. For each question below student responses have been transcribed under the heading of the group the students were in at the time.

1. When is it harder to answer a question, if the teacher is asking you or if a partner is asking you?

   Group 1

   "A partner. Because sometimes their questions don't make as much sense as your questions do."

   "I think partner because sometimes they don't know the right word for something. And then it is like a different thing."

   Group 2

   "When a partner is asking you because they don't describe the question as much as you."

   "I think sometimes the teacher because it's kind of depending on language. Like the French cause I don't always get the words and it's a little bit, no offense, more stressful."

   "The same as Anthony cause the partner doesn't describe it as well."

   Group 3

   "The teacher, well when you're talking with a buddy you know he's just going…he's just going to give you a better idea and when the teacher asks you you don't have a whole conversation."

   "I do agree with that."

2. Do questions help you to understand the math problem you are solving?

   Group 1

   "Yes. Cause sometimes the math question, let's say the math question was 1 plus 1. What is 1 plus 1. Well if you asked like how many maybe the question is 6 x 1

if you asked yourself, “How much ones does it take to make 6?” You could find out the answer. No you could find out the answer.”

“Yes. They help you get to the answer.”

“Math questions, it often can give you a hint.”

Group 2

“Mm, sometimes. If there is like a friend beside you, and the teacher asks you a question, and you didn’t put your hand up and you’re just kind of like sitting there, and you’re like oh no I wasn’t really thinking about it, what do I say now? And then your friend kind of gives you a hint and so you’re not embarrassed, you get to actually say something.”

Group 3

“It depends on the question you are asking. Like if you are asking something completely off topic it wouldn’t help.”

3. If you don’t know an answer, would questions help you to figure it out?

   Group 1

   “I think yes because if you don’t know an answer you might have forgotten something and you think oh yeah.” “It will give you a hint.”

   Group 2

   “Yes because judging by the subject and what the questions are about I bet you could figure out what the question is.”

   “I don’t know.”

4. Do you try to answer questions if you don’t know the words in French?

Group 1

"Yes. I try to see if I know, like I try breaking the word into parts and if there re tiny words in it and I know the words in French, I try saying it that way."

"If it is Mme asking it, you do like Bennett and see if there's any hints in a word, but if it's a friend asking you, you can just ask what the word means."

Group 2

"Sometimes because you like really know and you're like oh I really want to say this. So you just put up your hand and you realize you forgot this word cause you were thinking about it in your head, but you were thinking abut it in English."

Group 3

"Yes like I can tell Anika, when she asks me a question sometimes she says, can I say it in English and I say yes or no and if I say no then she says it in French."

"Then you can kind of describe or explain using other words."

"I try to find a similar word."

5. What strategies do you use to answer oral questions about Math problems.

Group 1

"I put up my hand?"

"You think about what Mme has been talking about, what the question revolves on and if you can find an answer." "And if it's a Math question, like if you do something like, 30 plus 30 you're going to do the Math in your head before, cause you're not going to put up your hand and then do the Math. You're going to have to do the Math in your head."

"Time." "Hints."

"Your friends can have other ideas that you can have."

"Other strategies." "Yeah and other ways, and if they think the answer is wrong, then maybe if it actually is wrong, they can maybe help you but if it's not wrong then you can help them."

"Cause when you are doing it by yourself it is hard to not know if it's wrong or right." "People have different strategies, and your strategy, you may have not thought of this part of the strategy and like your strategy may not be perfect for all these numbers. Your strategy and his strategy could be."

Group 2

"Well I try to think about the strategy that we are using at the moment. Like if we are doing division, multiplying and kind of take what I know from what we have been doing and put it into a, I kind of put it into one."

"I look at the details to make sure I didn't miss anything."

"I just try to think about it more and then trying to make it make sense."

Group 3.

"You need a little bit of time to think about it."

"Strategies. If you were doing a question like 5 x 5 you could use your fingers, ask a friend, brainstorming, paper."

6. Do you ask members of your group questions as you are solving math problems?

Group 1

"Yes, yes, yes yes!"

"I ask them like; "What does this word mean?" and umm I ask them to reread the questions to maybe, if I didn't get all the words. And stuff like that."

"I ask a question if I didn't understand something."

"Yah same with me."

"Yah, I ask them if I don't understand something, like if your partner doesn't know it, we try to figure it out both together and then if we can't figure it out we will ask the teacher."

Group 2

"Usually if I really get the question and they don't get the question then I do."

"Then I give them help. I describe to them what they did do or didn't do."

"Sometimes it helps if you have a bigger group than just partners, because if that person you ask didn't know it, then you can ask another person."

"Even when you are working in partners and both of you don't understand it, its better that you have each other because then you can understand it more because you are thinking about it. And you're like "I know this." And your partner is like "Oh yeah, that is a good idea." And since that is that, this is this."

Group 3

"Sometimes."

"Only when I need to know the question." "Sometimes I might be trying to solve a puzzle and then be like, "Wait this doesn't make sense. Does it make sense to you?"

"I usually do that because I don't want to go up to the teacher if there is like 20 people in the line going "Mme, Mme, Mme!"

7. Do you try to answer questions even if you don't know the answer or are unsure about the answer?

Group 1

"Sometimes. Sometimes, like, you're kind of sure about it, but then you realize it could be wrong. You need to decide. Sometimes you think, like, oh maybe it's wrong but then you decide I'll answ… ask it anyways cause I already have my hand up in the air." "Sometimes you're sure of the answer and then you're like I don't know."

Group 2

"Not most of the time, cause I don't want to embarrass myself."

"I'll be like this a little bit, "Let me think about this, no no I am not putting my hand up."

"Usually somebody beats me to the question because I don't get the question as much. I have to think a little bit more."

Group 3

"If you are unsure about the answer, you should still put your hand up and just try. It isn't actually your fault."

"If I am not to sure, I will try a different strategy and then it might work."

"Not usually because I am afraid I am not going to get it right."

7A. Do you ever feel embarrassed about answering a question?

"Sometimes."

"Maybe sometimes like….. if you don't know the word, maybe everyone else knows it and you just don't get it. Or you don't know what something is. So you'll probably get flustered."

"And you'll ask a question and people will say "oh I know that" and stuff."

8. Is it helpful to work in a group or have a partner to discuss math strategies before answering questions about how you solve a math problem?

   Group 1

   "Sometimes. Sometimes if you already have an answer and sometimes talking to a friend, it's just like you already have the answer." (Teacher: so you're just going to confirm your answer, confirm your strategy?) Nods head.

   "Maybe like, you can say like, okay let's come up with strategies and we'll see what one is better. Then you'll make yours and your partner makes theirs and you look at them and say "oh that one is pretty good."

   "You can discuss about, like,…if you get a question you can discuss like about like, when you get a question if you don't know them you can discuss about….see like ….you can discuss to see what it is."

   "It's like it's like…you have a thought, then another person's thought goes into your mind, your mind considers the thought and makes a new thought around it."

   "Another thing, let's say that the person you are talking to they don't think your strategy, like they say, "I think your strategy may not work for this number I think it works for some other numbers. And you could say well let's try it with a different, with an easy one that we already know and let's use it. If you had a bit of extra time you could do that."

   Group 2

   "Usually it is more helpful if you just have a partner and not a whole group. Then you get to tell more about the question and all that, to the one person you are working with."

"I like the group because there are more people but partners are good too."

"Also there are more brains. So it is smarter."

Group 3

"Yes sort of, but when you have a group not everyone agrees on the same thing. And it is a little bit harder to decide. With a partner it is a little bit easier. In a group you might have 4 selections."

"If you have 4 people in one group you might have 3 who want it one way and 1 who wants it another way, one of them doesn't agree."

8a. So what do you do if have different opinions?

"You could try them both."

"Try both of them and see which is the better solution. And use the one that is the best."

"It matters on the people. Sometimes you are the more the merrier, sometimes the less is better."

9. How can a teacher make it easier for you to answer questions about Math problems?

Group 1

"You can explain it good."

"Give us more time, if something like, often I think people don't have their hands up because they're like this they're thinking of the answer and then somebody like, just like somebody puts their hand up and their like "oh I don't have the answer yet, I'm just going to… and they just give up completely because the other person has their hand up and they knew it was going to be answered and blab la

blabla." "Yah just give people time like cause some people are still finding, like uhh , you don't really have to ask, you just need to wait and when everybody looks like their ready, then…"

"Yep!"

Group 2

"When they give you more time to think and they describe the question more to you."

"Sometimes slowly and if there are big words we don't actually know and you haven't taught us yet say it slowly or say it in English."

"If we are do something in math in the math book sometimes if we don't get something we can go to you and you can sometimes explain it to us in French, but we can still understand it."

Group 3

"Cause if you get it wrong she can help you through it. To get the right what this plus this."

"If you don't get it right, the teacher might make it a little bit easier the question. "think of it like this"."

"Kind of the same thing because if you get it wrong, she could give a little bit easier idea."

10. What worries you the most about answering questions about your strategies to solve Math problems?

Group 1

"That some people will find my strategies, that they don't think they are, yah it's like somebody is going to say to somebody, "blahblahblah I think about this strategy, blah blah blah."

"Not really anything! Sometimes judgement but not usually."

"I think the same as Bennett!"

Group 2

"Not much, just maybe one thing, if I don't get it I am going to embarrass myself."

"Definitely!"

"If I don't get the question and I don't get enough time to think about it."

"Sometimes it kind of helps if you ask us a question. …You're thinking about it and you don't really know." "But its good if you ask us that 'cause if you say I don't know, then you tell us and it makes us know."

Group 3

"Sometimes you don't always have a strategy maybe."

"Or you just find a new way or if it works or not."

Over and over again teachers hear about the importance of wait time. During the interview sessions, it was the learners who expressed this several times. Even in grade four, students are well aware of the importance of having time to formulate their thoughts

to be ready to express them. In providing different learning scenarios such as autonomous work, working with partners, working with small groups and whole class activities and discussion, students are exposed to different expectations of wait time. Wait time is also something to be taught to the learners. Patience and acceptance while working with a partner or in small groups that are not under the direct control of a teacher facilitator is something learners need to practice and use as part of being a strong collaborator.

Reflection

After viewing the videos of classroom mathematics tasks, reading the results of the online survey and viewing the video of the group interviews, I was struck by the maturity and insight of the grade four students who took part and responded throughout the project. This group of students is lucky to have strong parental support for their learning. Some students were confident and not intimidated to express their opinions, whether it was about the task or about how they responded to questions. Others were less willing to share their ideas or thoughts, but participated nonetheless, even if it was as a listener. Of particular interest was the response to the question: Is it helpful to work in a group or have a partner to discuss Math strategies before answering questions about how you solve a Math problem? The student responded, "You have a thought, then another person's thought goes into your mind, your mind considers the thought and makes a new thought around it." It is surely the point of learning today, especially in a second-language classroom, to be able to dialogue, to collaborate and to communicate our ideas and support each other's learning.

Relationship of Literature and Results

Language acquisition

During the analysis of the activities and observing the language used by the students when discussing and collaborating to solve mathematical problems, the assertion of Swain and Lapkin (1998) "Language is simultaneously a means of communication and a tool for thinking" was supported by the evidence collected. Students did talk to each other to confirm or refute their thinking, to share ideas and to compare thoughts. This was demonstrated in many of the activities, from asking a simple question like "Quelle heure?" in the ordering time task to the more complex interactions in the activity for constructing nets, where students confirmed their place in the activity and made sure they understood what the others in their group were doing. Further, more complex thinking was explained through the use of more multifaceted sentence structures, when there was a specified purpose to the discourse. When student explanation of a process for solving a problem was supported by manipulatives or illustrations, the level of complexity increased as did the confidence of the speaker. This was clearly illustrated by one student's explanation, using an illustration as a model, during the spatial awareness activity:

> J'ai fait un petit changement, parce que…
>
> J'ai fait un grand rectangle, puis un petit rectangle dans le milieu puis un ligne ce …de le coin
>
> Puis après j'ai fait un rectangle un petit peu comme….diagonale….en bas et après j'ai fait un carré.

The student was able to indicate the process even though there are grammatical errors in what was said. Another student gave the following explanation of what was seen and drawn during the spatial awareness (Quick Draw, Wheatley) activity:

> « J'ai vu comme cette partie, c'est comme un livre presque, comme tu peux le fermer. »
>
> « J'ai dessiné pour faire un carré et j'ai fait ma ligne, c'est ici, c'était comme… pas là. »
>
> « La première fois j'ai oublié cette partie mais la deuxième fois je l'ai vu et je savais que c'était comme un triangle. »

This student relates the shapes she sees to items she understands, like the shape of a book, and uses that thinking to relay her thoughts to her fellow students. She utilized an illustration to support her thinking and to use as a tool in her explanation. She also had the opportunity to observe and listen to other students convey their own thoughts on how they had seen and drawn a set of shapes in the same activity. These kinds of interactions solidly illustrate Bialystok's assertion (2001) when she states:

> Thus, there are strong interactions between the heard language and the conceptual system that the child is establishing. Therefore, we may not be surprised to learn that cognition is itself affected by the process of learning a language or, more specifically, the process of learning two languages. (p.190)

This interaction between language and concept development is the point that Adler (2001) reinforces:

> The induction of learners into mathematical discourses, and to informal and formal spoken and written mathematics, is widely acknowledged as a complex affair. All learners come into the school with informal ways of talking which they can bring to bear on their mathematical learning. (p. 72)

Adler's thoughts on language and mathematics illustrate that students use the language they know and the understandings they already have to communicate what they know about mathematics. This was aptly demonstrated by the explanations offered by the students. In the second-language classroom, students can explain their thinking, their processes and their understanding of the concept, even if they are limited in their vocabulary and grammatical accuracy. They can use their working knowledge of the language and use that vocabulary in the formulation of sentences that make sense, even if not entirely accurate grammatically.

Collaboration

The role of collaboration impacted how students respond and relate their learning. Dacy and Bamford Lynch (2007) reinforce using collaboration when they recommend whole-class discussion and small-group work to provide opportunities to share ideas and talk about what has been learned. This then becomes the scaffold that learners can use to build knowledge and skills (p.133). The importance of collaboration is illustrated both in the negative and positive. Students who chose not to collaborate had more difficulty in communicating their thinking. During the calendar activity, some students deliberately isolated themselves and did not rely on group members to assist them with completing the task. This was demonstrated in their limited responses with less complex vocabulary and lack of understanding of the concept:

Question:

C'est quelle journée de la semaine? Est-ce que c'est lundi, mardi, mercredi, jeudi…?

Response:

Je pense que c'est un…lundi.

Question:

Comment tu vas être capable de trouver quel jour de la semaine que c'est?

Response:

ummm uhhh je mettre comme 26, 25,

Another student who had engaged in dialogue with her group fared much better at being able to use complex sentence structures and incorporate personal information about her calendar.

Question:

Mary, explique à Mme ce que tu fais pour ton calendrier.

Response:

Ma jour special c'est le 27 mai. Parce que c'est ma fête et c'est sur un samedi. Le premier mai commence sur un mardi, il y a 31 jours dans mai.

It is ultimately the task of the teacher, as facilitator of learning, to ensure that students learn to collaborate, to share ideas and understand that this action of sharing what they

know contributes to a more solid grasp of concepts. The observations made in this study support Tudge (1992), "…the intersubjective understanding gained in the course of collaboration becomes the child's own (though socially derived) subjective understanding, an understanding that incorporates the shared understanding previously established" (p. 1366), and Swain, Brooks and Tocalli-Beller (2002) who state " . . . activities which are external to the learner but in which he or she participates (interpsychological) are transformed into mental ones (intrapsychological)" (p. 172). Opportunity for collaboration is also mandated by the 2007 Alberta Education Mathematics Program of Studies; "Meaningful student discussions provide essential links among concrete, pictorial and symbolic representations of mathematical concepts" (p. 2).

Collaboration and dialogue were obviously necessary to the learning of these grade four students and further illustrate Shor and Freire's (1987) thinking, "Dialogue is the moment where humans meet to reflect on reality as they make and remake it" (p. 13). The collaboration not only reinforced the concept learned, but provided multiple opportunities to use the second-language in context.

Questioning

The interconnectedness of questioning with language acquisition, collaboration and dialogue are key in the delivery of learning. The importance of placing the power of questioning in the hands of the learner is advanced by Cecil (1995),

> Habit is another block to the free flow of questions and answers in the classroom. . . . An example of this is when teachers ask all the questions (especially as indicated in the teacher's manual), instead of allowing children to ask their own questions and to answer one another's questions. (Pp. 20-21)

This was evident in the activities observed by the researcher. Students interacted well together and used basic questioning skills in their discussions about problems and tasks. Asking relevant questions that extend and enhance learning is not natural for all children, but is a skill that must be modeled and taught. Students need to be given support to encourage them to ask interesting, well thought out questions. This was evident in the interactions that took place among students during the activity to order time. Most students repeatedly asked simple questions that elicited simple, one-word answers from their peers rather than responses in complex sentences.

Careful questioning by the teacher is paramount in allowing students to learn to the optimum. Even teachers need to hone and develop this skill. In the spatial awareness activities from Wheatley , the scripted questions of "What did you see?" and "How did you draw it?" draw out the thinking of the students. Observations by the researcher support the necessity of building thoughtful questioning practices. Costa and Kallick (2000) speak of the importance of questioning in developing strong thinking skills. They state that; "Questions invite different levels and complexity of thinking…Teachers will want to use linguistic tools deliberately to engage and challenge complex thinking (p. 36). This will take careful planning by the educator. Walsh and Sattes (2005) believe all questioning should be carefully planned and formulated in advance to be the most effective. They suggest instructional purpose, content focus, cognitive level, wording and syntax, and reflecting on related beliefs as key points in the formulation process (pp. 49-50). The importance of teacher questioning was highlighted during the calendar activity when the teacher asked basic or knowledge-based questions, the students responded with simple knowledge based or yes or no answers. In the

instances where questions invited further thinking, students responded in kind, providing more information that represented the different paths their thinking had taken.

In a French Immersion context, where all students are second-language learners, language acquisition, collaboration, critical and complex thinking, and questioning are key in providing a dynamic learning environment. These factors are even more essential steps in the learning process of the content subject areas such as mathematics. The researcher has observed other educators discussing the difficulty of encouraging students to relate verbally their learning or thinking process. The findings of this inquiry demonstrate the importance of meticulous attention to these factors. When the teacher provides the opportunity for learning through careful application of language acquisition strategies, collaborative tasks and activities, and the use of questioning that encourages creative, critical and complex thinking, students will be able to relate verbally their thinking. This does not occur after one lesson. Teachers must purposefully plan and strategize with these factors in mind, looking for opportunities to include them in all learning situations. This is a change in how teaching and learning take place. No longer can the teacher rely upon a worksheet, autonomous activities or rows of students quietly completing tasks on their own. In Alberta, curricula are written to include the necessary provision of collaboration and critical and complex thinking. In the French Immersion context, the issue of language acquisition plays a vital role in the planning of the teacher. French Immersion students are able to function successfully within the requirements of various curricula (mathematics, science and social studies, for example).

This inquiry pinpoints the emerging importance of considering language acquisition in conjunction with collaboration, creative and critical thinking and most

importantly the questioning strategies the teacher uses. Purposeful attention to the types of questions, how and when they are asked and the opportunity for multiple questioning pathways is vital. Questioning is not only an important role of the teacher, but also a vital element of the learning journey of the student. The interconnection of language acquisition and collaboration in providing context for successful questioning and responding environments cannot be underestimated. Learners need regular exposure to these elements to build ability and confidence in expressing their processes and thinking.

Implications in the Classroom

The ability to respond to questioning in a second-language classroom requires a set of skills that need to be taught and modeled in a confidence-building atmosphere. Not all students in an elementary classroom will have the courage to share verbally on their own and others will not know how to express their thinking. Some students will be natural talkers, who have the confidence to share their thought processes verbally. Still others talk freely, without taking the time to think about what they should or could be expressing. A teacher must allow students the opportunity to work together, to share ideas in many ways, to have peer modeling to show what is expected and to have the time to develop fully thinking and produce a strong verbal message. Students need to think positively in an atmosphere of possibility and to know that their responses, thoughts and opinions will be considered.

This is impacted by several factors that can either inhibit or encourage these types of interactions. Student engagement, being involved in collaborative tasks, allowing for creativity, expecting critical thinking, giving appropriate wait time and building confidence for risk-taking are all necessary for students to communicate their thoughts in response to verbal questioning.

Engagement

Students can be engaged in their own learning in many ways. Using authentic tasks to which students can relate has been written about and recommended by many authors and researchers. Activities that incorporate student experience and include problem-solving which impacts their lives directly have a higher likelihood of being

engaging. Steve Seidel in Costa and Kallick (2008) affirms this when he states: "Questions come from engagement and from having our perceptions challenged (p. 248)." Activities must be interesting. If the task or question does not intrigue the learners, they will have no vested interest in finding a solution or sharing what they found out. A task should be challenging. If it is too easy, it will not spark dialogue or inspire learners.

When the teacher incorporates choice for students, it has been observed that the level of engagement rises. If students can decide how they will show their learning, with whom they will work, where they will work and which tools they will use to support their own understanding, they are more likely to embark with enthusiasm on a personalized learning journey. Choice is important. Adults expect to have this freedom in their jobs and in their learning. Children in elementary school also need experience with choice to learn how to use it and benefit from it. Learning to make wise choices with small responsibilities is an important step in becoming a strong collaborator, as well as a becoming a learner who can decide how to respond to questioning. Choice can be embedded in the questioning or in the task by allowing different ways to respond or to present solutions. This does require that the teacher become a facilitator, allowing the learners to be responsible for making decisions about their own learning.

Digital technology and the array of devices that students are exposed to today and more often possess can provide a variety of applications and programs which engage students. When students use these tools, they are often excited to show their learning in a new way. These tools can also be used to engage students verbally through the use of video or audio applications. Skilful use of digital technology and devices greatly

enhances the learning experience for many and can serve as support for those who may need different ways to express what they know. Children who may have difficulty speaking in front of larger groups, those who have difficulty with fine motor skills or those who need a challenge to extend their learning can all benefit from using a myriad of productivity applications that are now available for tablets and laptops. Students often have devices such as iPods which allow them to record video and audio, take pictures and create documents. They can also use applications such a PicCollage, Show Me, Garage Band, Pages, and many more that allow them to express their learning using a small, hand-held device. Learning and expressing learning verbally can take place anywhere and anytime.

Engaging students in employing questioning skills and developing critical thinking skills should be ever-changing. If the same routine is followed on a daily basis and includes the same style of questioning with the same type of lesson every day, it follows that engagement will wane. Students will benefit from having new ways to look at the world and new ways to do their work. Different ways of expressing their learning can open new doors. Allowing students to use physical movement, dialogue, art or music may give the teacher new insight into how a student thinks. In each classroom, students should have access to hands-on tools to assist them with their thinking. The use of a variety of strategies and tools should always be encouraged to give multiple opportunities for questioning and learning to take place.

Dialogue

It is essential that students have the freedom to express their opinions, discuss their strategies, bounce their ideas off their peers and share their conclusions in the classroom. The physical arrangement of the classroom is a factor that can either hinder or promote opportunities for dialogue. Students need spaces that allow them to work together, whether it is at groupings of desks, tables or on the floor. Desks or tables need to be facing each other to allow for conversation and collaboration. The nature of the task must also take advantage of the physical space of the classroom. Tasks that are inherently autonomous will not constitute a successful learning experience in a classroom that physically lends itself to dialogue and collaboration. A commitment must be made to providing an appropriate physical arrangement of the classroom, to lesson planning that incorporates opportunity for collaboration and to providing the opportunity for dialogue that goes hand in hand in creating the ability of students to respond verbally to questioning.

The opportunity to discuss responses to questioning, debate ideas and come to conclusions is a necessary part of learning that must be included in lesson planning. Learners need to be encouraged to share their strategies and thinking. Traditionally, this has not been the case in many classrooms where learning has been an autonomous activity. Even in elementary school, children are concerned about cheating, having their ideas stolen or having others copy them. It requires continual attention to providing collaborative opportunities so students can learn to comfortably dialogue and share with their peers.

Dialogue must be encouraged. The opportunity to work together needs to be available, modeled and used as a legitimate way to share and affirm thinking. Shor and Freire (1987) talk about teachers and students confronting inexperience with small-group, democratic communications, in which students, communicative beings, can transform their reality and become able to know what they know (p.13). Thus, the importance of working with a partner or bouncing ideas off a group of peers cannot be underestimated in the learners' ability to respond to questioning.

Tasks

The type of question or task offered by the teacher must provide the opportunity to engage, to participate in dialogue, to allow for creative thinking and to develop the critical thinking skills of the learner. The teacher must use a critical eye when choosing these types of tasks and carefully plan the opportunity for students to embark on this type of learning journey. The teacher must be willing to step away from the role of having the critical information that can only be used in a preset or single way. Learners, armed with a bank of strategies, use dialogue and discussion to find solutions, and then use any number of ways to record and present the responses. Costa and Kallick (2008) propose the Three Story Intellect model from Robin Fogarty in Brain Compatible Classrooms (p. 139) as a guideline in choosing stimulating questioning. The first level of questioning includes using words such as complete, count, define, describe, identify and select. These types of questioning words are designed to draw from students the concepts, information, feelings or experiences acquired in the past and stored in long or short-term memory (Costa, Kallick 2008 p. 138). In level two, students are required to process data. These types of questions or tasks use words like compare, contrast, classify and sort and

are designed to elicit cognitive objectives (ibid p.140). Finally, the third level of questioning requires students to speculate, elaborate and apply what they know. The questions would include words like evaluate, imagine, judge, predict, and apply. These kinds of questions and tasks require students to go beyond the concept and use it in a new situation (ibid p. 141). When considering this model or others like Bloom's Taxonomy, teachers then develop or find questions that will encourage students to dialogue, collaborate and be engaged in their own learning.

Wait Time

Students mentioned several times in the interviews for this project that having time to respond was important in their ability to formulate an answer that made sense. There are always students in the class that process quickly and can respond before the others. The challenge is to find ways to allow everyone to share their thinking, even when accounting for differences in learners. Many of the factors already implicated in the classroom can facilitate the provision of wait time. If students have choices in how to present their work, be it written, oral or presented through the use of digital tools, the length of wait time can be accommodated for different kinds of learners. In many cases, a verbal response can be recorded and edited, allowing students to verify their thinking before sharing it with a wider audience. Teachers can also use a variety of sharing strategies that encourage dialogue and collaboration. One example of this is the Think Pair Share method first suggested by Dr. Frank Lyman in 1981. (McTighe, Lyman, 1988 p. 19) This method asks students to think of a response, share it with a partner and then share it with the wider audience of the class. In this way, the student has had time to

think of an answer, compare with a partner and then with much less risk share a response with a number of others or the class as a whole.

With careful attention to student engagement, being involved in collaborative tasks, allowing for creativity, expecting critical thinking, giving appropriate wait time and building confidence teachers can maximize the impact of questioning in the second-language classroom. Students will appreciate the opportunity they are given when these factors meld to create much improved learning situations.

Final Thoughts

The ability to respond verbally, in a second-language, to questioning in the immersion classroom is achievable. Students with a variety of levels of language competency are able to find ways to communicate in their second-language to make themselves understood and to relate the processes they used to find a response. This, however, does not happen if clear attention is not paid to several factors. Students must have the opportunity to collaborate, the physical arrangement of the class must facilitate dialogue, appropriate verbal responses must be modeled, learners need the opportunity to use a variety of methods and digital tools to relate their learning in a number of ways. Lessons must be varied and lend themselves to discussion and sharing.

Collaboration is not natural for all students, but rather it is a skill that must be learned and practiced. Productive interactions among learners need to be modeled and encouraged. Some students require repeated opportunities in order to develop these skills. Typically, collaboration is best developed through providing tasks that work well for partners and small groups. Each member of the group needs to be encouraged to verbalize the thinking that results from the collaboration. If some are daunted by the thought of presenting verbally to a larger group, the small-group experience may be the ideal place for them to practice and build confidence. As well, the confident, well-spoken student can act as a role model for others in a small-group situation. It is up to the teacher to ensure that a variety of opportunities for verbal responses and sharing are provided to the students.

The physical arrangement of the class is key in encouraging dialogue and verbal response to questioning. If desks are in rows and students do not face each other,

discussion is likely to be limited. The teacher, who is looking for students to use the second-language being learned and for the sharing of responses and procedures among peers, must pay careful attention to groupings of desks in the classroom. Proper arrangements, with thoughtful placement of students, can result in illuminating discussion and learning, as this study has demonstrated.

Students will need models of how to respond adequately, both in using the second-language and in the way to explain a response. This can be provided by the teacher, but is most productive if the role models are peers. A number of digital technologies and applications provide excellent options for students to record verbally their responses and then listen to them and edit them, without the risk of embarrassment in front of their peers. It is ideal if the teacher can offer a variety of opportunities to respond verbally to questioning in the classroom.

Students are not necessarily going to pick up and use new vocabulary just through seeing the words in a textbook. Clear attention must be paid to introducing subject specific vocabulary, and then it must be explained and used regularly by the teacher and learners in the class. Students must understand the importance of using the appropriate language, since it will be used both verbally and in the written form. The reward comes in the richness of the responses, containing ideas and details and explaining processes.

A classroom needs to be developed as a learners' community. The students arrive and they bring with them the friendships and relationships developed in previous classrooms and at home. These friendships and relationships need to be reworked into trustful, thought-provoking working groups, where students have the opportunity to

contribute through questioning and responding, suggesting thoughts and ideas and listening. This is not an easy task, because even in elementary classrooms, students arrive with preconceived notions of their own ability, their place in the social order of the classroom and differing personalities. It is the teacher's role, as a facilitator of learning, to observe, plan, and arrange positive, collaborative situations for all students.

The image of a traditional classroom, with rows of quiet, hard-working students, heads down busily writing is far from the ideal. In reality, it is a distant memory. In the classroom where thinkers are encouraged, dialogue is promoted and collaboration is expected, the visual image is remarkably different. Learners have choices about where they work, with whom they work, and how they work. Dialogue is encouraged and expected. Students express their opinions, share their ideas and learn how to accept ideas and opinions from others. Opportunities for dialogue must be planned for and included in all facets of learning in the classroom. Without these repeated opportunities, learners will not develop the facility to share their opinions and thoughts, nor will they be as accepting of those of their peers.

Digital tools abound in the world of today's learner. Students are exposed to phones, iPods, tablets, laptops and desktops. These devices are engaging and enticing for students. They can be used to advantage in all facets of learning and it is the role of the teacher to include them in the completion of tasks and activities. Students can use these tools to compensate for perceived difficulties, to produce and present, to inquire and to share thoughts on their own thinking. The opportunities for learning using digital tools are limitless. Digital tools are no longer autonomous tools used in solitude. The multitude of applications have opened new doors to learning through providing many

ways to find and use information and then present it, visually and audibly. As learners work together to use these devices, new opportunities for dialogue and discussion arise.

Ultimately, it is the work of the teacher to consider these factors and use them in building sound questioning techniques. Teachers no longer just need to see what students know. They need to understand how students use information, how they think, how they problem-solve and how they use prior knowledge. Questioning must be multi-leveled, ranging from finding information, through processing that information, then applying it in new situations. Questions must promote thinking beyond simply finding an answer.

The second-language classroom is an amazing place. Children are busy producing, sharing, and learning together. They are excited to use digital tools. They love having choices about how they learn. They use their second-language to communicate. They are collaborators and work as partners, in small groups and as a large group. Most importantly they are able to express their thinking, explain their processes, and respond to questioning about problem-solving. They are 21st century learners, who are creative, critical and complex thinkers.

In the remarkable words of Sophie, a 21st century learner, "You have a thought, then another person's thought goes into your mind, your mind considers the thought and makes a new thought around it." Indisputably, these learners indeed are responding to questioning in the second-language classroom.

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Appendix A: Survey Results

1. How did you feel answering questions in class?	
Very comfortable	47.40%
Comfortable	52.60%
Uncomfortable	0.00%
Very Uncomfortable	0.00%
2. When you are asked a question, do you feel like you know the answer?	
All the time	5.60%
Most of the time	83.30%
Some of the time	11.10%
Never	0.00%
3. How do you feel answering questions in a small group?	
Very comfortable	47.40%
Comfortable	52.60%
Uncomfortable	0.00%
Very Uncomfortable	0.00%
4. How did you decide which questions to ask in your group?	
Our group talked about our questions.	52.60%
I thought of my own questions.	52.60%
The teacher helped me think of questions.	10.50%
I never asked any questions.	0.00%
5. Do you understand the questions that are asked in class?	
All the time	16.70%
Most of the time	83.30%
Some of the time	0.00%
Never	0.00%
6. I feel like my group listens to my questions.	
All the time	15.80%
Most of the time	31.60%
Some of the time	47.40%
Never	5.30%
7. I feel like the class listens to my questions.	
All the time	15.80%
Most of the time	57.90%
Some of the time	21.10%
Never	5.30%
8. I feel like my answers are listened to and accepted in my group.	
All the time	21.10%
Most of the time	52.60%
Some of the time	21.10%
Never	5.30%
9. I feel like my answers are listened to and accepted by the class.	
All the time	26.30%

Most of the time	63.20%
Some of the time	10.50%
Never	0.00%
10. I feel more confident now answering questions in class than I did when I started grade 4.	
All the time	36.80%
Most of the time	52.60%
Some of the time	10.50%
Never	0.00%

Appendix B: Sample Letters of permission regarding participation in the study

Explanatory Letter

École Elbow Valley Elementary

244209 Range Road 33, Calgary Alberta T3Z 2E8

Phone (403) 242-1117 Fax (403) 246-7666

email: evalley@rockyview.ab.ca

ROCKY VIEW SCHOOLS
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Dear Parents/Guardians:

Over the last 3 years I have been on the journey of completing my Masters of Education Degree. I am currently completing the process by undertaking a research project.

My research project is titled: Response to questioning in the immersion classroom. The purpose of my project is to create further understanding about the impact of questioning, asking certain types of questions and whether or not those questions will elicit more in depth responses from the students. I am specifically interested in how learning a second language can affect the students' ability to respond to all types of questions.

In order to facilitate this, I am requesting to film students completing tasks in the normal classroom setting, interacting and responding to questioning.

I will then view the video in order to analyze the types of questions students and teacher are asking and the types of responses from the students. Please note that this is to help me see the changes in the students' language development and understanding of concepts and by no means will it be used as a critique of your child and will not impact their achievement in grade four. Students, in small collaborative groups, will also be asked to respond to interview questions about oral questioning. All interviews will take place in the normal classroom, as part of the regular routine of discussion in a small group setting. A survey will take place as an individual activity during the class's regularly scheduled computer time.

Students will not be compensated for participation in the project. Students' marks and evaluation will not be based on participation in the project. Participation in the project is completely voluntary and if you should decide that your child would not participate, they will continue to participate as they normally would in classroom assignments and tasks, without fear of repercussion.

You have already signed and returned a F.O.I.P. form (part of each students registration package), which covers your child at our school board level. As this project is through the University of Lethbridge, and in order to protect the privacy of your child, there are several forms, which are important for you to read and understand. These include:

Participant (child) Consent Form, University of Lethbridge

Letter of Assent for the student, University of Lethbridge

Letter of Consent, Rocky View Schools

Consent to Disclose (general video consent form), Rocky View Schools

Data from this project may be used in academic presentations and professional presentations in educational or professional learning settings.

Participation of your child is completely voluntary and permission may be withdrawn at any time.

The forms, including information about the project are enclosed for you to read. Please fill them out, indicating your decision on participation, sign and return all, including the attached letters of consent, the student letter of assent as well as the Consent to Disclose form by May 18, 2012. **Please note that if you are not comfortable with your child being filmed they will still be in the classroom. I will ensure they are not filmed.**

I will be available to meet with you and share further information about the project if needed. Please contact me if you have any questions.

Thank you for your assistance with my research project.

Sincerely,

Stacy Pothier

Sample University of Lethbridge Participant (child) Consent Form

University of Lethbridge
Faculty of Education

PARTICIPANT (CHILD) CONSENT FORM

Response to Questioning in the Immersion Classroom

Your child is being invited to participate in a study entitled Response to Questioning in the Immersion Classroom that is being conducted by Stacy-Ann Pothier. Stacy-Ann Pothier is GRADUATE STUDENT in the Faculty of Education at the University of Lethbridge and you may contact HER if you have further questions by

Stacy-Ann Pothier
School: 403-242-1117
E-Mail: spothier@rockyview.ab.ca

As a Graduate student, I am required to conduct research as part of the requirements for a degree in Master of Education. It is being conducted under the supervision of Dr. Peter Heffernan and Dr. Martine Pellerin. You may contact my supervisors at:

Dr. Peter Heffernan
Phone: (403) 329-2186
E-Mail: peter.heffernan@uleth.ca

Dr. Martine Pellerin
Phone: 780-465-8601
E-Mail: pellerin@csj.ualberta.ca

The purpose of this research project will focus on the factors that influence a child's ability to respond to questioning about their process in problem solving and how they think about that process, as required by the 2007 K-9 Mathematics Curriculum from Alberta Education.

Research of this type is important because it will contribute to my personal understanding of how students respond to questioning in the French Immersion Math classroom. I will be able to use this understanding to assist other teachers in their own learning, which will in turn benefit their students.

Your child is being asked to participate in this study because your child is a student in the classroom of Stacy-Ann Pothier at École Elbow Valley School with Rocky View Schools. **Participation in this research project is completely voluntary.** Participation in this research project asks your child to participate as they naturally would in their regular classroom. The

project takes place during regular classroom time. If you decide that your child will not participate, they will continue to participate as normally expected in regular classroom learning activities and no video or audiotape will be taken of them.

If you agree to permit your child to participate in this research, his/her participation will include the observation of normal classroom lessons and activities, group interviews and individual survey questions about questions and questioning during regular classroom lessons and activities. All interviews will take place in the normal classroom, as part of the regular routine of discussion in a small group setting. A survey will take place as an individual activity during the class's regularly scheduled computer time.

Participation in this study will not cause any obvious risk, harm or inconvenience for your child.

The potential benefits of your child's participation in this research include contributions to the building of new understanding concerning a child's ability to respond to questioning from the teacher or peers during the teaching of Mathematics.

Your child's participation in this research must be completely voluntary. If you do decide to allow your child to participate, you may withdraw your permission (and your child from the study) at any time without any consequences or any explanation. If your child does withdraw from the study his/her image and voice in the audio/video recording will be removed. If your child's work was collected as a sample of learning activities, it would be removed from the data collection. As parents, you will be asked if the existing recorded data can or cannot be used in the study. **Only if your permission is granted will the data collected up to this point be used in the study.**

The researcher will review the data collection (audio/video recording, samples of student's work, field notes) and will seek new understanding concerning the factors that influence a student's ability to respond to questioning, both from the teacher and from their peers. The audio/video clips are taken to assist in the accurate recall of response to questioning and to ensure that the data collected is authentic.

Video and audio clips may be used in the final presentation of this research project, as partial fulfillment of Master's of Education. Permission will be sought for the researcher to use the audio/video recording segments in which your child's voice and image appear. Without your permission, your child's voice and image will not be recorded or used. There are several options for you to consider if you decide to have your child take part in this research study. You can choose all, some or none of them. Please put a check mark on the corresponding box(es) to indicate your decision for your child's participation:

- □ I grant permission for my child's work to be used as samples of learning activities.
- □ I grant permission for my child to be audiotaped while engaged in learning activities with his/her peers and the teacher during regular classroom time.
- □ I grant permission for my child to be videotaped while engaged in learning activities with his/her peers and the teacher during regular classroom time.
- □ I DO NOT wish my child to participate in this research project.

To protect your child's anonymity students will not be identified by name, but their likeness may be recorded on video if parents have signed a consent letter including a general video consent form for disclosure provided by Rocky View Schools. The video will not be used outside of the research or beyond the dissemination of findings.

Your child's confidentiality and the confidentiality of the data will be protected by storage of video and audio recordings in a secure environment and will be available only to the researcher. Written reports will be provided but they will make no reference to the students' names and/or the school attended. I may use selected video segments for the purpose of analysis of data and for the final presentation of the outcomes as a requirement of the research project. Videotaped or audiotaped data will be destroyed after completion and presentation of the project.

- □ I grant permission for videotaped segments in which my child appears to be used in the final presentation of the project.
- □ I grant permission for audiotaped segments in which my child appears to be used in the final presentation of the project.
- □ I DO NOT wish my child to participate in this research project.

Parents who have accepted the invitation for their child to participate in the research study will be invited at the end of the project (during the month of June 2012) to an open session in which the findings of the study will be presented.

In addition to being able to contact the researcher [and, if applicable, the supervisor] at the above phone numbers, you may verify the ethical approval of this study, or raise any concerns you might have, by contacting the Chair of the Faculty of Education Human Subjects Research Committee at the University of Lethbridge (403-329-2425).

Your signature below indicates that you understand the above conditions of participation in this study, that you have had the opportunity to have your questions answered by the researchers, and that you consent to having your child participate in the study.

_____	_____	_____
Name of Student	*Signature*	*Date*

_____	_____	_____
Name of Parent or Guardian	*Signature*	*Date*

A copy of this consent will be left with you, and a copy will be taken by the researcher.

Sample Student Letter of Assent

École Elbow Valley Elementary

244209 Range Road 33, Calgary Alberta T3Z 2E8

Phone (403) 242-1117 Fax (403) 246-7666

email: evalley@rockyview.ab.ca

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Madame Pothier's Project

Madame Pothier is doing a research project for her university degree. She will be video and/or audio-taping students during Math class. Students, in their Math groups, will also be asked about how they feel about answering questions. Students will also have the chance to complete a survey.

You can decide whether or not you want to participate. This project will not affect your mark in Math. Madame will not be using the videos she takes to decide what mark to give you.

Your parents will also be given information about this project. You should talk with them about whether or not you will participate in this project.

Please fill out the form below and hand it in to Madame with the other forms.

Name: _____

☐ I want to participate in Madame Pothier's project and be video and/or audiotape

☐ I want videotaped or audio taped segments of me to be used in educational presentations that Madame may do.

☐ I **DO NOT** want to participate in Madame Pothier's project and be video and/or audio taped.

Signature: _____

Date: _____

Sample Letter of Consent Rocky View Schools

École Elbow Valley Elementary

244209 Range Road 33, Calgary Alberta T3Z 2E8

Phone (403) 242-1117 Fax (403) 246-7666

email: evalley@rockyview.ab.ca

ROCKY VIEW SCHOOLS
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Research Project: **RESPONSE TO QUESTIONING IN THE IMMERSION CLASSROOM**

Stacy-Ann Pothier EDUC 6000, EDUC 6001 Masters of Education, Faculty of Graduate Studies, University of Lethbridge,

403-242-1117

spothier@rockyview.ab.ca

This consent form, a copy of which has been given to you, is only part of the process of informed consent. It should give you a basic idea of what the research is about and what your child's participation would involve. **Participation in the research project is COMPLETELY VOLUNTARY.** If you would like more details about something mentioned here, or information not included here, you should feel free to contact the researcher. Please take the time to read this carefully and understand any accompanying information.

Rocky View School Division has approved this research study.

Purpose of the study:

Teaching in a French Immersion context has raised questions for me about how students are able to respond to oral questioning in my classroom. I have observed students struggling to express their thoughts and wondered why this was happening.

The intent of the study is to explore the factors that influence their ability to respond to questioning about their process in problem solving and how they think about that process, as required by the 2007 K-9 Mathematics Curriculum from Alberta Education.

What will my child be asked to do?

Your child is being asked to participate in this study because your child is a student in the classroom of Stacy-Ann Pothier at École Elbow Valley School with Rocky View Schools. **Participation in this research project is completely voluntary.** Participation in this research

project asks your child to participate as they naturally would in their regular classroom. The project takes place during regular classroom time. No assignments will be given that are beyond those that are regular curriculum based assignments. If you decide that your child will not participate, they will continue to participate as normally expected in regular classroom learning activities and no video or audiotape will be taken of them.

What type of information will be collected?

As your child is a student in the classroom of Stacy-Ann Pothier, there is a potential that he/she may be incorporated into the audio and video recording of the students working together with their teacher/researcher. There is no harm associated with the participation of you child in this research project. The researcher may also wish to incorporate a sample of your child's work as an illustrative example to support new understanding gained by the implementation of new teaching strategies. Field notes (observational notes) will also be taken by the researcher. Children may be interviewed for about their reaction to questions and being questioned. They may be asked to complete a survey.

Your child's participation in this research is voluntary. As parents, you are free to decline this invitation to have your child participate in this research and can always change your mind once you have agreed. If you should decide that your child will not participate, they will continue to participate in classroom activities and tasks as they normally would. The researcher will not video or audiotape them. As parents you have the right to withdraw your child from the study, and have your child's image and voice in the audio/video recording removed. If your child's work was collected as a sample of learning activities, it will be removed from the data collection. As parents, you will be asked if the existing recorded data can or cannot be used in the study. **Only if your permission is granted will the data collected up to this point be used in the study.**

If you agree to permit your child to participate in this research, his/her participation will include the observation of normal classroom lessons and activities, group interviews and individual survey questions about questions and questioning during regular classroom lessons and activities. All interviews will take place in the normal classroom, as part of the regular routine of discussion in a small group setting. A survey will take place as an individual activity during the class's regularly scheduled computer time.

Participation in this study will not cause any obvious risk, harm or inconvenience for your child.

The potential benefits of your child's participation in this research include contributions to the building of new understanding concerning a child's ability to respond to questioning from the teacher or peers during the teaching of Mathematics.

Your child's participation in this research must be completely voluntary. If you do decide to allow your child to participate, you may withdraw your permission (and your child from the study) at any time without any consequences or any explanation. If your child does withdraw from the study his/her image and voice in the audio/video recording will be removed to prevent identification. If your child's work were collected as a sample of learning activities, it would be removed from the data collection. As parents, you will be asked if the existing recorded data can or cannot be used in the study. **Only if your permission is granted will the data collected up to this point be used in the study.**

The researcher will review the data collection (audio/video recording, samples of student's work, field notes) and will seek new understanding concerning the factors that influence a student's

ability to respond to questioning, both from the teacher and from their peers. The audio/video clips are taken to assist in the accurate recall of response to questioning and to ensure that the data collected is authentic.

Video and audio clips may be used in the final presentation of this research project, as partial fulfillment of Master's of Education. Permission will be sought for the researcher to use the audio/video recording segments in which your child's voice and image appear. Without your permission, your child's voice and image will not be recorded or used. There are several options for you to consider if you decide to have your child take part in this research study. You can choose all, some or none of them. Please put a check mark on the corresponding box(es) to indicate your decision for your child's participation:

- □ I grant permission for my child's work to be used as samples of learning activities.
- □ I grant permission for my child to be audiotaped while engaged in learning activities with his/her peers and the teacher during regular classroom time.
- □ I grant permission for my child to be videotaped while engaged in learning activities with his/her peers and the teacher during regular classroom time.
- □ I DO NOT wish my child to participate in this research project.

To protect your child's anonymity students will not be identified by name, but their likeness may be recorded on video if parents have signed a consent letter including a general video consent form for disclosure provided by Rocky View Schools. The video will not be used outside of the research or beyond the dissemination of findings as part of the final presentation of the research project.

What happens to the data collection during the study?

Your child's confidentiality and the confidentiality of the data will be protected by storage of video and audio recordings in a secure environment and will be available only to the researcher. Written reports will be provided but they will make no reference to the students' names and/or the school attended. I may use selected video segments for the purpose of analysis of data and for presentation of the outcomes as a requirement of the research project. Videotaped or audiotaped data will be destroyed after completion and presentation of the project.

- □ I grant permission for videotaped segments in which my child appears to be used in the final presentation of the project.
- □ I grant permission for audiotaped segments in which my child appears to be used in the final presentation of the project.
- □ I DO NOT wish my child to participate in this research project.

Are there risks if my child participates in this research study?

The researcher does not see any obvious risk, harm or inconvenience for your child to participate in the research study.

Are there benefits if my child participates in this research study?

Your child's participation in this research study may contribute to building of new understanding concerning a child's ability to respond to questioning from the teacher or peers during the teaching of Mathematics.

Your signature on this form indicates that you understand to your satisfaction the information provided to you about your child's participation in this project. In no way does this waive your

legal rights nor release the investigator or sponsors or involved institutions from their legal and professional responsibilities. You are free to withdraw your child's participation from this research study at any time. Please feel free to ask for clarification or new information throughout your child's participation.

Questions/concerns: If you have further questions concerning matters related to this research study, please contact:

Stacy-Ann Pothier

403-242-1117 or spothier@rockyview.ab.ca

Or your school's principal:

Celia Barrington 403-242-1117 or barrington@rockyview.ab.ca

Or Faculty Co-Supervisors:

Peter Heffernan peter.heffernan@uleth.ca

Or

Martine Pellerin pellerin@csj.ualberta.ca

Child's Name(please print): _____

Parents' Name(s): _____

Parents' Signature: _____

Researcher's Name: _____

Sample Consent for Disclosure Rocky View Schools

Permission to Video, Blog, or Photograph a Project

Due to the fact that children may be identifiable, this is to be considered a disclosure of personal information and as such is legislated under the Freedom of Information and Protection of Privacy Act Chapter F-25 s40.

Consent for Disclosure of Student Personal Information As the parent/legal guardian of the child named below, I hereby give consent to allow my child to be recorded under the conditions of the project described below:	
Date:	May, June 2012
Project Description:	The research project is titled: Response to questioning in the immersion classroom. The purpose of my project is to create further understanding about the impact of questioning, asking certain types of questions and whether or not those questions will elicit more in depth responses from the students. I am specifically interested in how learning a second language can affect the students' ability to respond to all types of questions. In order to facilitate this, I will film students completing tasks in the normal classroom setting, interacting and responding to questioning. I will then view the video in order to analyze the types of questions students and teacher are asking and the types of responses from the students. Please note that this is to help me see the changes in the students' language development and understanding of concepts and by no means will it be used as a critique of your child and will not impact their achievement in grade four.
Risk of Exposure:	Your child's confidentiality and the confidentiality of the data will be protected by storage of video and audio recordings in a secure environment and will be available only to the researcher. Written reports will be provided but they will make no reference to the students' names and/or the school attended. I may use selected video segments in the final presentation of the research project. By signing the

	consent forms, as well as this Consent for Media coverage, you will be giving me permission to use the selected audio/video segments in the final presentation of this project. Videotaped or audiotaped data will be destroyed after completion and presentation of the project. Parents who have accepted the invitation for their child to participate in the research study will be invited at the end of the project (sometime in June) to an open session in which the findings of the study will be presented.
Teacher Name:	Pothier
School:	École Elbow Valley Elementary

Student Name:	
Parent/Legal Guardian Name: *(please print)*	
Parent/Legal Guardian Signature:	

For further information, contact your school principal

or Rocky View Schools' FOIP Coordinator at 403.945.4039.