

The Calgary Jewish Academy
Mathematics Program Review

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The Calgary Jewish Academy

Mathematics Program Review

Introduction:

The proposal for the review of the mathematics program of The Calgary Jewish Academy identified five main areas to be studied. The review would collect information with reference to:

1. Context Evaluation

How is the mathematics program part of the larger school curriculum?
What beliefs are held by the parents, students, and teachers about mathematics?

How is the provincial curriculum implemented?

Are there sufficient connections made between the processes and the content of math?

What work is being done in the area of professional development?

Do the students have access to any remedial or enrichment programs?

Is this school offering a cohesive and coherent implemented curriculum?

2. Resource Evaluation

What budget is provided for mathematics courses?

What instructional resources are being used?

To what extent are students using concrete materials?

How much time is provided for instruction in mathematics?

3. Process Evaluation

How do the teachers' goals or objectives for mathematics align with the school goals?

How do teachers plan for instruction?

What staff development support activities are available? What are the methods of instruction used?

Is there evidence teachers use constructivist approaches to teaching?

What kinds of assessment are teachers using in mathematics classes?

How are teachers making connections to technology?

4. Product Evaluation

What are the strengths and deficiencies of the mathematics program?
How are students succeeding on provincial assessment tests? What types of other standardized testing is used and what is done with the data?

How are teachers evaluated on an on-going basis?

What are the grades of students?

What kinds of student awards are provided for mathematics achievement?

How is staff rewarded for distinguished work?

How have things changed from the last evaluation?

5. Future Planning

How are courses being revised?

What criteria are used for revision?

What is the plan for implementation of the new curriculum? How will teachers be provided support?

What are the plans for increased use of technology?

How might students be provided extra supports?

How do students transition from this school to high school?

Data Collection:

The process of collecting data about the mathematics program offered at the Calgary Jewish Academy included the following data-gathering techniques.

- Observation of mathematics teachers conducting classes with an opportunity to get a sense of students' mathematical thinking and how teachers use resources and effective questioning to create a quality learning environment.
- Interview all teachers to identify how they plan, the resources they use, and how they work with the Alberta Curriculum.
- Interview administration about their role in the implementation and review of mathematics curriculum.

- Meeting with parents and also community members to hear their perspectives on the mathematics program being offered.
- Meeting with student groups representing various divisions at the school.
- Review of school results on the grades 3, 6, and 9 mathematics achievement testing program over the last five years.

Observations:

Context Evaluation:

The Calgary Jewish Academy is a unique school as it is built on a foundation of Judaic Studies. This focus permeates the school and the culture is one of pride in being part of a community committed to a common culture. The students are proud of their work in Judaic Studies and it is very obvious as you walk through the school these accomplishments are highlighted. The environment is one of respect and caring for each other. The teachers are very committed to the mission of the school and work hard to implement the Alberta Curriculum.

The time required to deliver the Judaic Studies means both teachers and students must work very hard to implement the prescribed mathematics curriculum. The community, including the parents hold very high expectations for their children and there is an expectation that almost all students will go to university.

When teachers were interviewed about the place of mathematics in the larger school curriculum, they all agreed this was very important. Parents see mathematics as essential to their children's success. Despite this, the implementation of the curriculum needs to be addressed as it varied over the divisions.

In delivering the mathematics program, teachers were asked about the connection made between processes and content. In their responses the teachers focused on content including Number and Operations, Geometry and Measurement, Statistics and Probability and Patterns and Algebra. They

tended to not respond to the processes of mathematics including Reasoning, Connections within and outside of mathematics, mathematical communication, representation of concepts and problem solving. Generally the area of processes, especially representation required explanation. However, there are a few teachers who are using writing in the mathematics classes. The use of teaching through multiple representations (translating between visual, concrete, contextual, verbal, and symbolic forms) is a commitment that needs to be addressed. Some teachers are using concrete materials but a number of teachers feel the math manipulatives are only to be used for explanation and the teachers seem to severely limit their use in favour of symbolic manipulation. The area of mental math shows great strength in some grades as students responded well when questioned.

Teachers were asked about their work in the area of professional development. Most teachers reported having some opportunity in the past but very few have done any significant professional development in mathematics recently. Much of the challenge with regard to a lack of professional development opportunities may center around a perceived lack of resources which would allow teachers to have time to attend. A group of teachers are involved in a Galileo Project where they will examine how to use an inquiry approach to teaching. This will be a very positive learning experience for both teachers and students.

The Calgary Jewish Academy does have students who are special needs and coded according to provincial regulations. ESL students receive pullout support and resource help for language development. Teachers report there is a need for additional resource time for some students. Other students have been identified for enrichment. One teacher has coordinated math competitions and a unique extracurricular math enrichment program called Math by Mail. In addition some teachers do move to content beyond the curriculum. The issue of vertical versus horizontal enrichment needs to be explored more carefully. Some students are being enriched vertically by doing work from upper grades as teachers may feel this is a way to prepare them to do well in the future. The opportunity for horizontal enrichment where students study topics of special interest and investigate big problems within their grade level should be explored. Teachers have been involved in professional development for special needs and early intervention as well attending workshops on gifted students.

Resource Evaluation:

When asked about a budget for mathematics, most teachers responded by stating they did not know if there was a budget. Some thought they could simply ask the administration for resources if needed. A number of teachers reported they were aware of new resources being approved for courses but they have not seen them. Teachers did not know how the resources would be selected. Initial information provided indicated the optional implementation for K, 1, 4, and 7 was taking place but it became obvious during data collection that most teachers did not have the information to implement the new program.

Teachers reported they were far too busy in their scheduled classes to be able to get together to plan together. There were, however, some collaborative planning meetings held in 2006. One teacher was identified as being a mentor for new teachers and a few teachers did say they met outside the regular school day to talk about students and the program. Teachers have as many as eight different preparations per day and have limited time during the day to do preparation work. The result is not just extremely busy days but many hours of preparation outside of school.

There are many challenges when it comes to use of concrete materials. All children need to have access to concrete materials as they provide the basis for learning at this age level. In some cases, teachers have not had the professional development needed to support them in effectively using the materials for concept development. With time being a precious commodity, there appears to be a belief that teachers must be very efficient in covering the content and so there may be no time for exploration using concrete materials. Often the concrete materials have to be shared between teachers and, in the rush of the daily activity, it requires too much work to go finding the material. One teacher reported the students did not need the concrete representation.

Teachers express a desire to use technology in their classrooms but the challenge is the availability of the technology. When technology is being used it not always in line with best practices. There is also the concern of some teachers about how to use some of the technology, for example, some expressed concern about how to use a Smartboard in a mathematics classroom.

Process Evaluation:

Teachers were asked how they were aligning their instruction to the Alberta Curriculum. Although most teachers reported they were familiar with the Program of Studies, teachers stated they used a particular text to address the outcomes and, in some cases, they were unfamiliar with the outcomes for their grade level. Most teachers thought it was very difficult to make connections to other disciplines in their math classes. The exception would be in division one where language and math were seen as often being connected and children's literature was frequently employed in the math class.

Ideas about learning processes involved in studying mathematics were not clear to all teachers. Some teachers are making very concerted efforts to build accurate mathematical language while other teachers reported they did not have time. Problem solving is being done by most teachers as they have their students attack problems with various strategies, however, there seems to be very few attempts to teach through problem solving. It was noted the use of multiple representations decreases as the grade increases. Teachers do a great deal of work on mental math and estimation and this was observed as being very strong in the classrooms. A number of teachers in division one were using journaling in their classes and some very good work in this area was observed.

When asked about how teachers differentiate instruction, the responses were very mixed. In junior high it was reported there was some additional work in math while another teacher reported some students did additional work at the next grade level on their own. In the elementary grades it was reported there was no additional extension of work in math while others reported a great deal was done with resources for LD and ESL students. There was a recommendation from several teachers to return to tracking "at-risk" students.

Excellent classroom instruction by some teachers was observed during data collection. The students are very bright and very respectful. Many teachers reported they follow a general plan for instruction involving the cycle of review-teach-seatwork. Teachers were asking very good questions – Why? How did you ...? Is there another solution?

However, there seems to be some inconsistency from year to year. Some parents thought this was the result of teacher competency. As one parent stated, *“It is different every year and one year was all photocopied sheets with emphasis on getting the answers without much understanding”*.

Teachers are very concerned the students do well and this seems to be driven by an emphasis on ensuring the students get high marks. Assessments are primarily summative in nature. Several assessments that were to be given to the students were examined and it was determined the questions focus on fairly low levels of thinking including ‘knowledge’ or ‘recall’.

Product Evaluation:

The students score significantly higher than the provincial average on provincial assessments. This appears to be directly related to the culture of the school that places high expectations on students from both parents and teachers. However, One deficiency is the limited time for the scheduling of mathematics classes and time on task doing mathematics. The students compensate for this limitation by working very hard.

When we examine provincial assessment results there is a pattern that appears. If we follow the same group of children from grade 3 to grade 6 to grade 9, there is a significant drop in the percentage of students who are achieving excellence while the percentage for the province remains relatively constant. Of the group of Jewish Academy students who wrote the grade 3 provincial achievement test in 2000-2001, 76.5% achieved a level of excellence. The same group of students scored 67.6% level of excellence when they wrote in grade 6 and, in 2006-07 had achieved 38.5% level of excellence when they wrote in grade 9. If we examine the group that wrote in grade 6 in 2006-07, 18.5% attained a level of excellence while this same group was at 45.2% level of excellence when they wrote in grade 3. As you look back over the years these patterns are repeated.

Under school policy teachers are evaluated on a regular basis. There does not appear to be any merit system for teachers who are demonstrating exceptional work. Community members are very interested in this concept and students are given various academic awards at the grade levels.

There are anecdotal reports from administration, teachers, and parents about students who have graduated from the Calgary Jewish School stating they do extremely well in grade 10.

Future Planning:

The administration requires the teachers submit course outlines and long term plans. There is very little time during the day for planning. No long range plan for the implementation of the new curriculum was indentified during the data collection.

In discussion with teachers and the coordinator of technology there is need for much more work to be done in developing a vision for integrating technology into the school.

The administration has identified the need for future professional development in mathematics and has made some plans in the area. The administration is seen as being very supportive of the teachers.

One grade not included extensively in this program evaluation was Kindergarten. Kindergarten teachers did provide some information and identify concerns about delivering the Alberta Curriculum. They are currently doing work beyond the prescribed curriculum in number and there is a need to include them more fully in future reviews. The importance of having students achieve the outcomes in Kindergarten Mathematics cannot be under estimated as this is the age where children build the visual skills needed for developing number sense.

What can we learn from the students:

The students were very articulate and honest. In division one classes there was some opportunity to speak with students. They enjoy mathematics and solving problems and feel very confident at doing mathematics. Children were observed being challenged by some very important questions.

Students from grades 4-6 (or division two) also participated in the data collection process. When asked if they use concrete materials they told me "*they were too smart to use them*". The students like their math classes and believe solving problems is fun and interesting. These students felt they

needed more enrichment as the work was too easy at times. Their understanding of how they were really learning mathematics was limited and they described the process of doing well in mathematics by saying they understood if they do their worksheets for review they will get good marks because that is what is on the test.

The most interesting comments came from the junior high students who were the most vocal. When asked what they thought math was all about they responded that it is about problems, equations and learning facts. They believe some people are good at Math and others better in Language Arts. Some expressed little enthusiasm for math saying it was boring and they spend time doing the same questions over and over. They believed that *“teachers can be too easy with the students as they give so many bonuses the mark is not a true mark”*. Perhaps the most telling comment was from a student who responded to the question – What might be your greatest concern in mathematics? She stated, *“ I worry that I learn 100% of the work when we are doing it and so I get very good marks but then at the end of the year I think I only know less than 50% of the work”*. Her peers agreed they generally felt the same way.

Recommendations:

Recommendation #1: It is recommended a long term plan for the implementation of the new K-9 Alberta Mathematics Curriculum be established.

Rationale

The curriculum’s connection to the provincial curriculum is uneven; some instruction is clearly connected whereas other does not appear to be solidly linked. For K, 1, 4, and 7 the province is finishing an optional implementation year. Some teachers are well aware of the changes and the resources available while other teachers appear to have little information.

The curriculum’s sequence is not always in line with the provincial documents. In some cases, teachers are doing work outside the prescribed

curriculum while leaving parts of the curriculum out. “A Curriculum is more than a collection of activities: it must be focused on important mathematics and well articulated across the grades.” (NCTM, 2000, p.14)

Teachers must be helped to understand the curriculum sequence as rational, with more complex ideas building upon simpler ones respecting students’ developmental levels and prior learning. The newly created long term plan must support the delivery of a coherent and cohesive curriculum.

Developing such a long term plan must involve all stakeholders. There is need for staff to be aware that funds are available for materials, there are professional development plans, time lines, and someone who will ensure accountability.

Each teacher must ensure they are completing what they are supposed to at each grade level with appropriate depth for understanding, in order for all children to be successful. Once all teachers are aware of how the work they are doing fits within the larger K-9 math program plan, the issue of falling percentage of excellence on provincial math assessments should be corrected.

Recommendation #2: It is recommended the school develop a plan for the use of technology in the mathematics program.

Rationale

A plan that would look at how to support teachers in using technology to address curriculum outcomes needs to be established. Technology is essential in learning and teaching mathematics; it influences the mathematics being taught and enhances students’ learning. There are many opportunities for improved technology at the school. A number of teachers have expressed interest in having computers in the classrooms and there is expertise at the school in how to use technology. The limited availability of Smart Boards makes it too difficult to plan to use them technology in their teaching. The created plan must also include having teachers look at various pieces of

interactive software such as Fathom or Sketchpad and learning how to use the software effectively.

All teachers must be involved in linking the ICT outcomes to their math instruction. Teachers must come to an understanding of what essentials are necessary for all students to be technologically literate.

“Technology permits students to focus on mathematical ideas, to reason, and to solve problems in ways that are often impossible without these tools.”
(Van de Walle and Folk, 2005 p.7)

Recommendation #3: It is recommended student assessment practices be examined through broader lens.

Rationale

Many teachers expressed concern marks are being stressed excessively by parents and students. Students in the junior high report marks are easy to obtain and everyone expects high marks. However, there appears to be little understanding about marks truly represent.

The current emphasis on assessment in the school is on summative assessment and effort is needed to move more towards assessment for learning, that is formative assessment. Upon examining the mid-term exams it is clear the emphasis is on assessing knowledge and recall rather higher levels of thinking such as comprehension and problem solving. Students need to be asked to demonstrate their understanding through communication, making connections, reasoning, and through multiple representations.

Recommendation #4: It is recommended an audit take place of math materials in the school with a goal of building resources for each classroom.

Rationale

Teachers want to use concrete materials but in many cases do not have easy access to the materials. Once an audit has taken place a decision could be

made about materials needed. Sharing concrete materials is not the best practice as it has been shown teachers will not use the material if they are not readily available. These materials should be available to students at all times , including provincial achievement testing.

Disparity does exist between classes with regard to manipulative material. Some teachers have overhead projectors and manipulatives for the overhead while others do not. All classes need to be equipped equitably. Teachers also need professional development in the effective use of concrete materials. All grade levels must use concrete materials, including junior high mathematics classes. Symbolic manipulation, driven by rules, is a very limited way to demonstrating understanding of mathematics concepts. Teachers must be assisted in understanding how the use of concrete materials can better demonstrate deep understanding of concepts.

Recommendation #5: It is recommended the present system of scheduling and time allocation for mathematics instruction be examined.

Rationale

The present restrictions on scheduled class time place extreme stress on teachers, particularly at the upper grade levels. The limited amount of time means teachers have to move very rapidly through the provincial outcomes and students may be getting a very superficial understanding of concepts. Time is necessary for exploration and assimilation of concepts.

Scheduling thirty minute periods is in conflict with the philosophy of the mathematics program that asks students to think deeply about concepts. Worthwhile tasks in the classroom take time for investigation and are not manageable within 30 minutes. While it is true we can teach basic skills in small periods of time, this not so for major concepts, so longer periods of time for work on mathematics are needed.

Recommendation #6: It is recommended teachers attend regular meetings that focus on mathematics teaching and learning.

Rationale

The teachers demonstrate adequate knowledge of content and of their students. There are many efforts being made to accommodate all learners. Because there has been little work done in the area of math professional development, the issue of pedagogy is an important area to consider when planning professional development.

Some teachers have made a partial commitment to a team planning process but this is very informal. For example, decisions have been made about math resources with some teachers but other teachers seem to be unaware of these decisions. There is a culture of respect and support for each other but, in general, teachers are working in isolation.

The teachers have heavy work assignments. It appears there has been little time to meet and plan together. If the teachers had a period of time during the school week to meet and share ideas, they would grow as professionals. Many approaches can be used. For example, the journals “Teaching Children Mathematics” (grade K- 4 teachers) and “Teaching Mathematics in the Middle School” (grade 5-9 teachers) could be used for study groups. Having one teacher present an idea from the journal to the group would build the pedagogical skills of all teachers.

Summing Up:

The Calgary Jewish Academy has students who have high achievement levels in mathematics. There is no doubt that many factors contribute to this success. The expectations of parents and the community play a significant role. The culture of the school is one of working hard to achieve high results. The expectations of teachers are also that every child must do well.

And while we can celebrate the success of past years, it is imperative that plans be made so that even higher levels of achievement can be made. There is no doubt that the implementation of a coherent and cohesive curriculum, aligned to the Alberta Curriculum, integrating technology and focusing on processes to be learned will benefit every child.

References:

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