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Mathematics K–6 support materials for students with special education needs

**Case study 3**

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# Introduction

The Year 4 class teacher is planning a unit of work for the Statistics and Probability Strand (Substrand: Chance). In developing a whole class program to meet the learning needs of all students, the teacher needs to consider the particular learning needs of one student, Emma.

Emma has moderate hearing loss and wears hearing aids for both ears. She communicates orally and requires support to regulate her speaking volume. Emma uses an FM transmitter, for which the teacher or directed communication partner wears the microphone. Emma experiences difficulty with sentence structure, including verb tenses and plurals. She sometimes misses word endings and some high frequency sounds, such as ‘s’, ‘sh’, and ‘f’. Emma also experiences difficulty pronouncing these sounds when speaking. To assist Emma’s language development, she is encouraged to use new language in each of the programmed lessons and in a range of contexts.

Emma uses lip reading to supplement her hearing aid and FM transmitter. She becomes fatigued when listening for long periods of time.

The target audience for this content is: Parents, Students, Teachers, Principals

* Selection of outcomes and content
* Learning experiences and assessment opportunities
* Determining the starting point for instruction
* Collaborative curriculum planning
* Feedback
* Teaching strategies for the learning experiences and assessment opportunities
* Evidence of learning
* Evaluating

# Collaborative curriculum planning

Emma, her parents, teacher, Stage supervisor, speech pathologist and specialist teacher for hearing, have been involved in the [collaborative curriculum planning](http://educationstandards.nsw.edu.au/wps/portal/nesa/k-10/learning-areas/mathematics/special-needs-in-mathematics-guide/planning) process. The process has determined that, across the key learning areas:

* Emma is working towards Stage 2 outcomes
* Emma is working towards the following goals:
	+ improving the intelligibility of her speech
	+ increasing her understanding of conceptual language
* The implementation of the following [adjustments](http://educationstandards.nsw.edu.au/wps/portal/nesa/k-10/learning-areas/mathematics/special-needs-in-mathematics-guide/implementation/4-adjustments) enables Emma to participate in teaching and learning experiences and assessment opportunities:
	+ the teacher assists Emma in maintaining the effective use of audiology devices, including the FM transmitter and hearing aids
	+ Emma is seated in the classroom in a position that maximises her opportunity to see those who are modelling, and other visual cues
	+ the teacher facilitates the development of Emma’s receptive language by ‘chunking’ information, rephrasing instructions and explanations, limiting the length of instructional sentences, providing written instructions and visual supports as a permanent record for Emma’s reference, and reducing background noise when Emma is required to listen to the teacher or to peers
* pre-teaching key vocabulary for units of work
* peers may assist Emma by repeating or demonstrating instructions/expectations and standing when they are speaking to gain her attention
* the teacher pauses after each instruction for 10 seconds to give Emma sufficient time to process the information, and to formulate a response, when appropriate
* the teacher facilitates the development of Emma’s targeted speech sounds by modelling vocabulary and planning opportunities in collaboration with the speech pathologist.

Priorities identified for Emma by the teacher relevant to the unit of work are to:

* expand her understanding of mathematics-specific language
* use targeted mathematics-specific language and speech sounds in group discussions.

# Determining the starting point for instruction

The teacher has gained initial information about the students’ knowledge, skills and understanding in the Statistics and Probability Strand (Substrand: Chance) from their Year 3 reports.

The students were recently assessed to determine their achievement in relation to Stage 1 and Stage 2 outcomes for the Chance Substrand, and the starting point for instruction.

The assessment has indicated to the teacher that Emma can:

* describe the element of chance for familiar activities
* sort and describe familiar events as being ‘possible’ or ‘impossible’ by choosing a picture of a particular event and explaining why the event is possible or impossible
* compare two familiar events and explain which event is more likely or less likely to occur.

The teacher has identified that Emma has an understanding of the following language relevant to the unit of work:

always

impossible

less likely

likely

maybe

more likely

never

possible

sometimes

sure

unlikely

unsure

will happen

won’t happen

sure

The teacher has identified that Emma does not have an understanding of the following language relevant to the unit of work:

certain

equal chance

fifty-fifty

likelihood

one chance in two

Uncertain

# Selection of outcomes and content

Using the evidence of learning from the assessment for Chance, the following outcomes and content were selected for the class.

| **Outcomes** | Syllabus content |
| --- | --- |
| MA2-1WM Uses appropriate terminology to describe, and symbols to represent, mathematical ideasMA2-19SP Describes and compares chance events in social and experimental contexts | Conduct chance experiments, identify and describe possible outcomes, and recognise variation in results (ACMSP067)* use the term ‘outcome’ to describe any possible result of a chance experiment
* predict and list all possible outcomes in a chance experiment, eg list the outcomes when three pegs are randomly selected from a bag containing an equal number of pegs of two colours
* predict and record all possible combinations in a chance situation, eg list all possible outfits when choosing from three different T-shirts and two different pairs of shorts
* predict the number of times each outcome should occur in a chance experiment involving a set number of trials, carry out the experiment, and compare the predicted and actual results
	+ make statements that acknowledge ‘randomness’ in a situation, eg ‘The spinner could stop on any colour’ (Communicating, Reasoning)

Describe possible everyday events and order their chances of occurring (ACMSP092)* use the terms ‘equally likely’, ‘likely’ and ‘unlikely’ to describe the chance of everyday events occurring, eg ‘It is equally likely that you will get an odd or an even number when you roll a die’
 |

# Teaching strategies for the learning experiences and assessment opportunities

The teacher:

* explicitly teaches the language of chance through modelling, and records target language on charts of synonyms
* uses questioning during the learning experience to provide the students with opportunities to use new language, prompting students where necessary to use correct language
* rephrases student responses to model the correct mathematics-specific language
* links the learning experience to the Data Substrand by incorporating graphing
* links the explanation of fifty-fifty to the Fractions and Decimals Substrand
* records the target language used by students, for assessment purposes.

# Learning experiences and assessment opportunities

As part of this unit, the teacher is planning to implement the following learning experiences and assessment opportunities. The teacher has documented the adjustments that Emma needs in order to access the planned learning experiences and assessment opportunities.

| **Learning experiences and assessment opportunities** | Adjustments for Emma  |
| --- | --- |
| Expected Result | * Emma is pre-taught to articulate mathematics-specific language, incorporating targeted speech sounds (eg fifty-fifty) by the specialist teacher for hearing
 |
| *Part A*The teacher says, ‘What are the possible outcomes when I toss this coin?’Students give their responses and the teacher explains that ‘When I toss one coin there are two possible outcomes, “heads” or “tails” . I have one chance in two of getting “heads” and I have one chance in two of getting “tails”. This is an equal chance of getting “heads” or “tails”. There are different ways of saying “equal chance”. I can also say “one chance in two”, “equally likely” or “a fifty-fifty chance”.’The teacher models coin-tossing a number of times, using the target language and demonstrating the use of tally marks to record the results.Possible questions include:* What outcomes can occur when a coin is tossed once?
* What is the likelihood of tossing ‘tails’ in a single toss?
* What chance is there of tossing ‘heads’ in a single toss?
* What is a ‘fifty-fifty’ chance?
 | * the teacher wears the microphone for the FM transmitter
* the teacher pauses after each sentence to give Emma sufficient time to process the information
 |
| The students, in pairs, predict the outcome of tossing a coin and then toss the coin, telling the teacher their prediction and whether they obtained ‘heads’ or ‘tails’. The teacher, using tally marks, records the students’ predictions and results in a table. The teacher graphs the results using either a picture graph or column graph. | * Emma’s partner wears the microphone for the FM transmitter
* Emma is positioned so that she can see her partner and the teacher
 |
| *Part B*Students are asked to predict the result of a number of tosses of a coin. They use tally marks to record the outcomes in a table, and graph the results. The teacher uses mathematics-specific language, relevant to Chance, during questioning.Possible questions include:* How many ‘heads’ and ‘tails’ do you expect to get in two tosses?
* Did the expected result and the actual result match?
* Which outcome, ‘heads’ and ‘tails’, is more likely?

Students are encouraged to suggest how the experiment could be improved and implement their plan. This activity could be extended to tossing two coins. |  |
| Certain, Uncertain | * articulation of mathematics–specific language is pre-taught to Emma by the specialist teacher for hearing, eg certain
 |
| *Part A*The teacher writes the headings ‘Certain’ and ‘Uncertain’ on the board. The teacher explains that ‘certain’ means the same as ‘sure to happen’ or ‘will happen’, and that ‘Uncertain’ means the same as ‘not sure to happen’.The students’ understanding of ‘certain’ and ‘uncertain’ is developed using simple pictures. The teacher questions the students about each picture and places each picture under the correct heading, repeating the explanation. | * the teacher wears the microphone for the FM transmitter
* the teacher links new language to familiar language for Emma
 |
| *Part B*The students write the headings ‘Certain’ and ‘Uncertain’ on a sheet of paper. In pairs, they are asked to list under the headings things that they think are ‘certain’ and things that they think are ‘Uncertain’ today at school. Students discuss their findings.*Extension:* Students devise their own rating scale using the language of chance. | * Emma’s partner wears the microphone for the FM transmitter
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# Feedback

The teacher monitors students during the learning experiences and assessment opportunities through:

* observation of student discussions when they are working in pairs
* teacher-led discussion and questioning
* analysis of the students’ work samples.

The teacher provides specific feedback, such as:

* ‘Well done, “equal chance”, “one-in-two chance” and “fifty-fifty” should all be halfway along your rating scale.’
* ‘The column for “tails” on your graph does not match the tally marks in your table. Fix the column so that it matches the tally marks.’
* ‘Emma, your group predicted that you would toss one “head” and two “tails”. After you tossed your coins you recorded three “heads”. Your graph shows “heads” had the higher result. This was not your expected result.’
* ‘Emma, “certain” means “sure to happen”. You have recorded Sport in the “certain” column. Last week Sport was changed to Thursday because it rained. Sport would be better in the “uncertain” column.’

# Evidence of learning

The teacher uses students’ work samples (predicted and actual results, graphs, lists of ‘certain’ and ‘uncertain’ events), anecdotal notes of observations, checklists of indicators and checklists of target language to determine whether students have made progress as a result of the learning experiences.

## Criteria for assessment

Students are assessed on their ability to:

* list all the possible outcomes in a simple chance experiment, eg ‘heads’, ‘tails’ (if a coin is tossed)
* conduct simple experiments using coins and record the results
* explain the difference between expected results and actual results in a simple chance experiment
* apply an understanding of equally likely outcomes in a particular situation, eg tossing a coin
* describe events as being ‘certain’ or ‘uncertain’.

# Evaluating

The teacher makes judgements about the effectiveness of the teaching program based on the evidence of learning. This informs future [programming](http://educationstandards.nsw.edu.au/wps/portal/nesa/k-10/learning-areas/mathematics/special-needs-in-mathematics-guide/programming) and instruction.

The teacher evaluates Emma’s use and understanding of targeted mathematics-specific language and use of speech sounds.