

# CHOOSE MATHS

MENTORING

AN AMSI SCHOOLS PROJECT

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# How to Make a Difference as a Mentor

Ann Rolfe, Founder: Mentoring Works

**Mentoring**  
Works



Hi, I'm Ann Rolfe, founder of Mentoring Works

I have a background in adult learning, career counseling and professional development. I've been in business for 30 years, specializing in mentoring for the last 20. Some of the programs I've been involved in recently, include:

Australian Mathematics/Australian Science Innovations Trust: Curious Minds and DigIT

Georgia Tech (USA): Alumni Association Mentor Jackets Program

RMIT University (Australia): Industry Mentoring Program

SAGANet (USA): STEM Mentoring Labs Webinars for mentors

University of New England: Balancing The Equation mentoring program or women in STEM



This ebook contains the content of the webinars run for **CHOOSEMATHS** mentors in October 2017

Our goal is to make mentoring easier, more enjoyable and more effective for you. This ebook is about:

1. How mentors make a difference
2. Your role as a mentor
3. Building online relationships
4. How to keep girls engaged
5. Critical skills and practical techniques for mentors



Dr Julia Collins, CHOOSEMATHS Women in Maths Network Coordinator

Julia is coordinating CHOOSEMATHS Mentoring as well as GEM (Girls Enjoy Maths) days around Australia to try to encourage more girls to take mathematics in Years 11 and 12. Julia joined AMSI in December 2016, having previously worked at the University of Edinburgh, where she spent five years working in mathematics outreach and lecturing.



Associate Professor Inge Koch, Executive Director, CHOOSEMATHS

Inge joined AMSI in mid-2015 as the Executive Director of the CHOOSEMATHS project, building on a strong career as a research mathematician. Her research interests are in statistical learning and data science and their applications to cancer research. Throughout her career Inge has been passionate about encouraging young women to study and take up careers in mathematics, running workshops for female high school students while at UNSW and the University of Adelaide.



Janine McIntosh, AMSI Schools Program Manager and CHOOSEMATHS Program Director

Janine manages the AMSI Schools division, which includes the CHOOSEMATHS project. She is an experienced primary teacher, has lectured in mathematics education at the University of Melbourne, and leads a professional development and schools visit program for teachers across the country. She is also one of the authors of the ICE-EM Mathematics textbooks, and was one of the writers for the Australian Curriculum: Mathematics F-10.

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MATHS**  
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# How Mentors Make A Difference

# CHOOSEMATHS

## AIMS

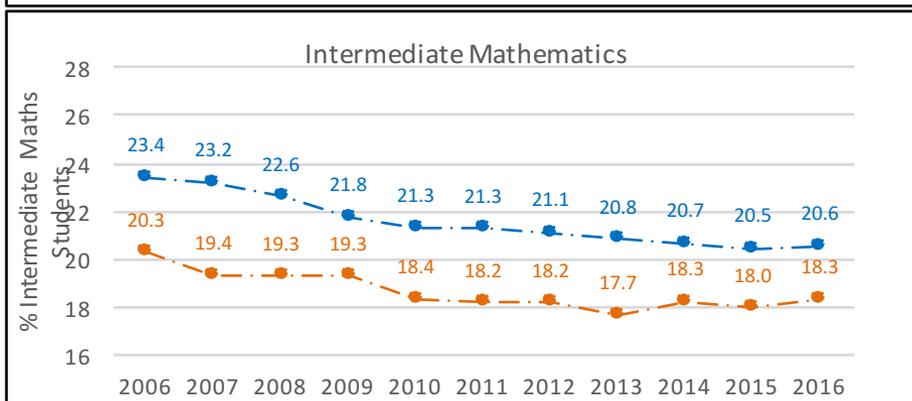
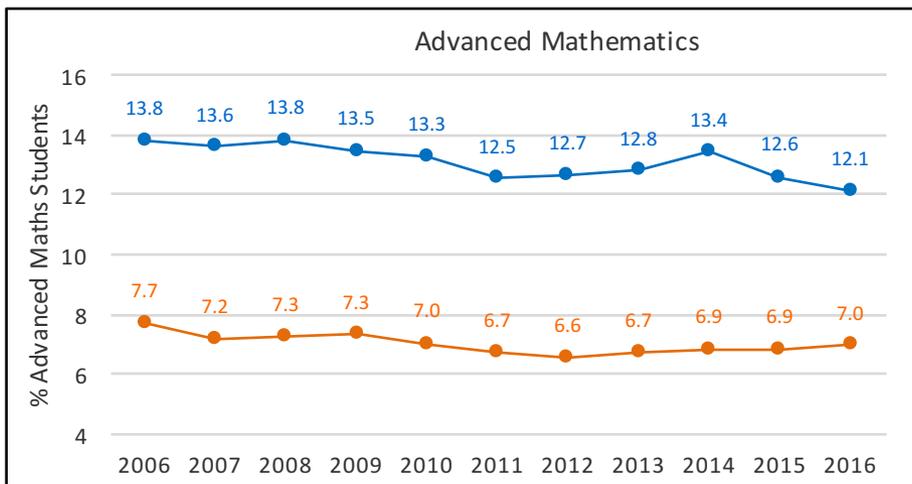


CHOOSEMATHS is a partnership between the Australian Mathematical Sciences Institute (AMSI) and the BHP Billiton Foundation.

The project aims to:

- Change community attitudes
- Increase participation in mathematics and statistics
- Improve maths-related career choices, especially for girls and young women.





The number of students taking intermediate and advanced maths has been dropping for the past 20 years. This slide shows the percentage of Advanced Mathematics students in Y12 from 2006-2016. Boys (blue) and girls (orange).

Participation rates for Intermediate Maths in Y12 are higher than for Advanced Maths, but have been dropping since 2006 and in both cases girls participation is significantly lower than boys.

The trend continues in university where women account for just one quarter of Australian Mathematics undergraduates.



**25%**

# Why?

Based on your own experience, observations or opinions, what are some of the barriers or problems that reduce girls participation in maths?

Participants in the webinar suggested:

- Early gender conditioning. For example, girls are pushed towards more nurturing activities. Boys are pushed towards STEM.
- I found men in the maths department to not understand how difficult it was to be an isolated woman in classes and in the department
- I found the number of females in mathematics, was a lot better than IT or engineering. Was I an outlier? It was still about 30% females though
- I've been in a 40 student second year maths tute with 2 female students
- In high school there was always the idea that maths and Physics were boys subjects... attending a girls school at least reduced that thought a little
- 1 in 10 girls in my first year maths lectures!
- I think 'interdisciplinary research' should be emphasised. Because I have a B Mathematics, does not mean I am confined to only studying equations all day.
- in my case we were 50% female at uni level on my Mathematics program
- Lack of confidence in own abilities, especially in comparison to boys.
- Self-doubt, imposter syndrome
- For mathematics, teaching is considered as the only job option and those who do not want to be teacher run away from mathematics.
- Fear of not being successful in STEM could be a contributing factor.
- Lack of female roles.
- Nerd culture unattractive to girls

**What we can contribute will be different for each of us, but clearly as mentors we can make a difference. In which of these areas could you make a difference?**

By not choosing high level maths students cut out a huge portion of the potential job market.

# Careers in Mathematics

More than just numbers

## « Level 2 »

ACCESSIBLE THROUGH  
DIPLOMA OR  
CERTIFICATE III / IV

AIRCRAFT MAINTENANCE ENGINEER  
DRAFTSPERSON BIOMEDICAL TECHNICIAN  
CONSTRUCTION MANAGER CARTOGRAPHER  
CIVIL ENGINEERING TECHNICIAN COMPUTER  
TECHNICIAN DATA PROCESSOR ELECTRICIAN  
INSURANCE CLERK LABORATORY WORKER  
LINE MECHANIC MECHANICAL TECHNICIAN  
PERSONAL TRAINER PROCUREMENT MANAGER  
PRODUCTION MANAGER TELCO ENGINEER

## « Level 1 »

ACCESSIBLE THROUGH  
YEAR 12 COMPLETION  
OR CERTIFICATE I / II

BANK TELLER BARTENDER DEBT COLLECTOR  
HOSPITALITY WORKER INSURANCE AGENT  
PAYROLL OFFICER RETAIL BUYER SALES  
ASSISTANT TRADES ASSISTANT

## « Level 3 »

ACCESSIBLE THROUGH  
BACHELOR DEGREE

ACCOUNTANT AIR TRAFFIC CONTROL  
ANALYST BIOTECHNICIAN BUSINESS  
ANALYST COMPUTER SYSTEMS ANALYST  
COMMERCIAL UNDERWRITER  
CRYPTOLOGIST DATA ANALYST ECOLOGIST  
GAME DESIGNER INDUSTRIAL DESIGNER  
INSIGHTS ANALYST MARINE SURVEYOR  
MARKET RESEARCH ANALYST NURSE  
OPTOMETRIST PHARMACIST  
PHARMACOLOGIST PILOT QUANTITY  
SURVEYOR SOFTWARE ENGINEER  
SYSTEMS ANALYST TEACHER VETERINARIAN  
WEB ANALYST WEB DEVELOPER

## « Level 4 »

ACCESSIBLE THROUGH  
BACHELOR DEGREE &  
POSTGRADUATE

ACTUARY AERONAUTICAL ENGINEER  
ARCHITECT AUDITOR ASTROPHYSICIST  
BIOINFORMATICIAN BIOMEDICAL ENGINEER  
BIOSTATISTICIAN CHEMICAL ENGINEER CIVIL  
ENGINEER DATA SCIENTIST ECONOMIST  
ELECTRICAL ENGINEER ENVIRONMENTAL  
ENGINEER FINANCIAL ANALYST GEOLOGIST  
GEOMATICS ENGINEER GEOPHYSICIST  
GEOSPATIAL SPECIALIST MECHANICAL  
ENGINEER MARINE ENGINEER  
MATHEMATICIAN METEOROLOGIST MINING  
ENGINEER NAVAL ARCHITECT OPERATIONS  
RESEARCH ANALYST PHYSICIST QUANTITATIVE  
ANALYST RESEARCH SCIENTIST RISK  
ANALYST ROBOTICS ENGINEER STATISTICIAN  
UNIVERSITY LECTURER

**75%** OF THE FASTEST  
GROWING OCCUPATIONS  
REQUIRE **STEM** SKILLS

*PwC Report 2015*

This is why it's so very important to increase girls participation in maths at school.

It's important for girls themselves, for women, for our communities and for the future of our country.

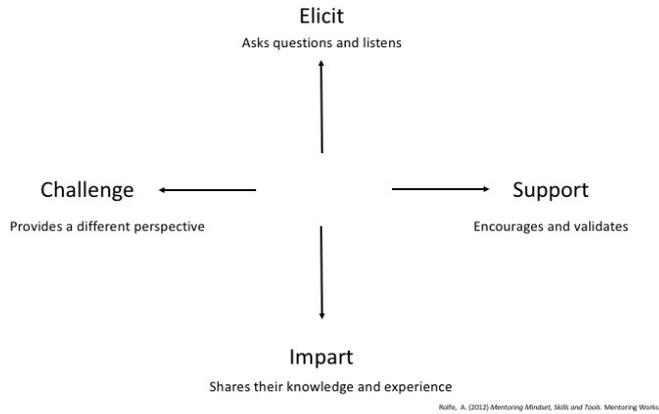
# Your Role As A Mentor

# What did your mentors do?

## Participants in the webinar said:

- My mentors always made me feel like I could achieve whatever I wanted and offered help and advice on how to get there
- I've had mentors who have just answered questions that I've raised but the better mentors have asked me questions and then given advice based on my answers (or lack thereof)
- They recognised my abilities and told me about opportunities that were available to me. They then kept checking in with me and continued to encourage me over prolonged periods
- Gave me the confidence to take on new challenges I don't think I'm ready for
- Suggested possibilities I hadn't thought of
- Encourage and motivate by setting himself or others as example
- Convinced me that I was good enough to aim high and succeed
- They used their own experiences to relate to my situation and shared their difficulties/weaknesses and how they faced them. Lead by example
- Mentors in my life generally encouraged me to aim high, whatever my desired goal, urged me on
- Showing up is important, that is, putting in the time and making the move to engage with another person
- Mentors have shown me possibilities ahead that I couldn't yet see myself, or believe I could achieve
- Mentors have been available to talk to when I needed, and always brought another perspective
- Mentors in my life have provided guidance and support for my career
- The best mentors have taken time to get to know me, then matched the stories they told to my own inclinations and preferences
- Some good mentors I've had have been very enthusiastic about the subject and passed on the excitement

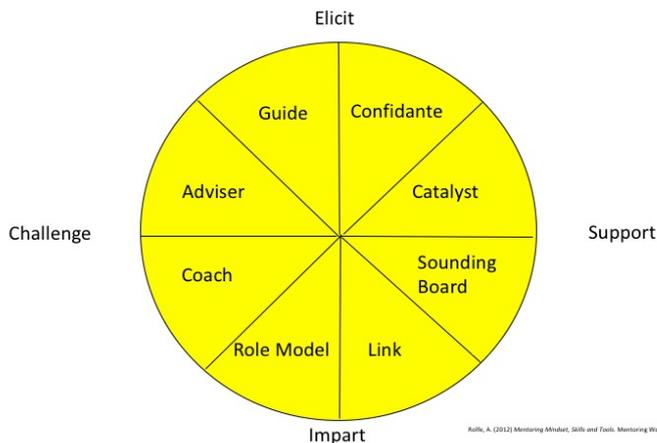
# Mentoring Dynamic



The traditional view of mentoring is “wise guide”, one who imparts their wisdom, who shares their knowledge and experience. This is a valid part of what a contemporary mentor does but, before you ever start to impart, you must first build trust and rapport. To do that you ask questions and listen. Draw them out, ask a question, listen and ask another question.

It is not an either/or dichotomy, it's a spectrum you move along. Neither end is good or bad. You will adjust according to the situation, the person and the topic. However, asking and listening builds trust and rapport. It is asking and listening that will let you know what they need and asking and listening is where you start, especially in the beginning of a mentoring relationship. You will help them solve problems, but you don't want to build dependence and you don't want to spoon feed them. You're building their capacity to solve problems on their own.

## Mentoring Roles



We generally think of a mentor as someone who provides support, who encourages and validates, and that is what you will do. Yet, wouldn't you also want someone who challenges your thinking? Who offered a different perspective? Again, this isn't either/or. You'll do both.

I think of the Mentoring Dynamic like a dance floor that you move around in a dance with your partner. You move and respond, deciding when to simply validate their thinking, and when to offer a different view that will stretch them. You choose when to speak, when to be silent, when to ask, but always listen.

Building on the foundation of the Mentoring Dynamic we can expand our model of mentoring roles.

The mentor becomes a **confidante**, someone who is trusted enough to share dreams, aspirations and issues.

Sometimes, all people need is quiet listening. Simply speaking their thoughts out loud generates insight, solutions or actions that become obvious. So the mentor, just by being supportive, is a **catalyst** for change.

A mentor is often a **sounding board** someone to “bounce ideas off”.

Mentors often **link** a person to other resources or people that can provide information. The mentor doesn't have to have all the answers!

The mentor is a **role model**, their behavior and approach provides an example.

**Coaching** may be a subset of mentoring. If asked, a mentor may help the person develop specific skills and abilities.

People who want mentoring sometimes want an **adviser**. They value the knowledge, ideas and opinions that come from your experience but don't be too quick to assume this role.

A mentor is also a **guide**. I believe that a mentor has what I'd call a “duty of care”. That is, if a person intends action you know is dangerous, share your concerns with them. A mentor imparts information. However, it is always the person themselves that decides, acts and produces the outcome.

# Be a role model



Point to role models



Explore careers



Help them see their strengths



Be a role model



What you want to do is **get them thinking** about possibilities for themselves. **Point to** and encourage them to see role models. **Explore** a wide variety of careers. Take every opportunity to **help them see themselves**, their talents and strengths, because all too often girls look in the mirror and do not see the powerful, courageous, strong person they are, or could be. They need someone to reflect that back to them. Don't shy away from being a **role model**. What you do and what you say are on show. They will take their cues from you. You don't have to launch into it straight away, because that may put them off, but do tell them about your achievements and your challenges.

# Building Online Relationships

First impressions count. So the first session is most important. Conversations will get easier as everyone gets to know each other and gets used to Zoom and the meeting format.

#### Rapport and Trust



New relationships need **rapport and trust** to grow. You already know their favourite subjects and career ideas so you can use that to prompt conversation. Find something you have in common with the girls and incorporate that into your self-intro to start building rapport. Mention one or two by name as you say what you have in common, e.g “I am an engineer. Emma and Caitlin, I notice you have ideas about careers in engineering and I’m looking forward to exploring that with you both”.

#### Interests



I’d suggest that as they introduce themselves, get them to mention their out of school interests and hobbies and make a note of these. You’ll then be able to ask them about their dancing, horse riding, sport or gaming activities etc. and link maths to their **interests** as well as their subjects and career ideas.

#### Suspend Judgement



Draw out students with good questions and active listening and support them with encouragement and validation. This is particularly important at the beginning of your mentoring relationship and with shy or quiet people. Listen for clues and look for their excitement and energy.

#### Self-disclosure



Build trust so that they are ready to hear the wisdom you impart. As they become more confident you can gently challenge their thinking and provide a different perspective. You want to build their critical and creative thinking. To build trust, the key will be your ability to ask a lot of questions without it seeming like an interrogation. You’ll need to listen well and **suspend judgment**, so that they feel safe to keep talking.

**Self-disclosure** is helpful in building trust, so share as much about yourself as is appropriate in your conversations. Show that you can relate to them and their experiences. You may reveal your vulnerability as well as your strength.

# How to Keep Girls Engaged



Active  
“Heads-up”  
Positive Reinforcement  
Be Prepared  
Key Take-aways  
Action

It will be really important to get them **actively involved** as early as possible.

Make the first activity simple and non-threatening. I nearly always run a poll as the first activity on my webinars, because its an easy and safe way to get participation early. Introducing yourself could be a bit intimidating for students, so you might start with a fun ice-breaker. If you do, it needs to fast, easy **and related to your topic**.

Try to give them a **heads up**, that you're about to ask a question, so they can prepare their answer. Make a question specific and only ask one at a time.

If you're not getting the participation you want, you might say something like "I'd like to hear Emma's thoughts on this and then Caitlin's. If you can, choose the most outgoing or confident person first, but if she's not ready say something like: "That's OK, take a few minutes to organise your thoughts and we'll come back to you". Your tone of voice should be friendly and supportive.

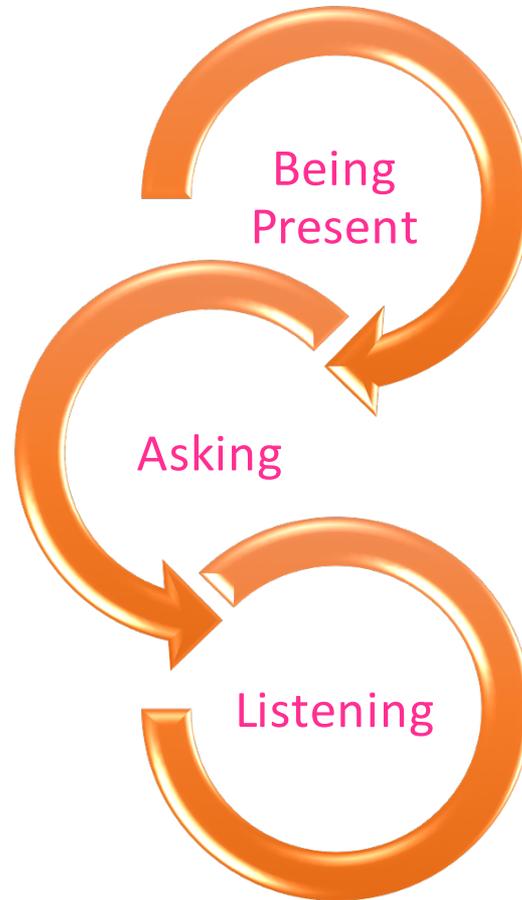
Some students may be shy at first and **positive reinforcement** for participation will be important. That might just mean saying "thank you" and their name after they speak. You don't want to sound patronising, but phrases of positive feedback will encourage them and others to speak up e.g "Good comments, Caitlin. Who else has a thought on this?" You want them to get the hang of participating, not just listening.

The key to making any sort of meeting work is **being prepared** – when you have an agenda ahead of time and know what to expect it is a lot less daunting. The meeting format and topics have been laid out for you. The more you can do to help the *girls* come prepared, the easier it will be. At the end of each session ask them to prepare their questions on the topics for the next session.

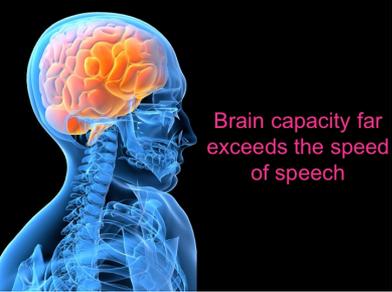
At the end, I also ask people to both write and share what their **key take-away** is. This reinforces their learning and helps build positive intentions for the next time. I also like to get people to state their **actions or next steps** before they go. Getting people to say that out loud increases their commitment and the likelihood that they'll do it. You should note what they say to follow-up next time. You don't want to be punitive if they haven't done it, rather, help them, maybe post a reminder on the discussion board.

# Critical Skills and Practical Tips

# Be a “PAL”



**These three skills may be harder to implement than they seem.**



I guess we've all been guilty of losing focus during an online meeting or phone call. Perhaps it's happened to you during the webinar.

It's because the brain's capacity for processing far exceeds the speed of speech. And, no matter how fast I speak your brain has excess capacity. What does the brain do with all that excess capacity? Anything it wants to!

Because you and I can't see each other, and because we **think** we can multi-task, it's easy to check email, look at your phone or just let your thoughts stray.

It takes both personal discipline and skill to be totally present. Here are some of the ideas participants shared for staying focussed:

- Taking notes reinforces the things you have just heard
- Use visuals, mind maps and diagrams
- When doing Video conferences I make eye contact with speakers so they know I am listening
- No phones!!
- Turn off other applications or devices

You **will** be able to see the girls and they'll see you. So one thing you can do is be present, and model attentiveness yourself.

What behaviours would you model?

PAL skills are interconnected and support one another. If we are present and listening well it is easier to ask good questions. The classic quote from Rudyard Kipling below is still taught in journalism today because it sums up how to get to the heart of the story.

*“I keep six honest serving men  
they taught me all I know;  
Their names are What and Why and When  
and How and Where and Who”*

Rudyard Kipling (1902) *The Elephant's Child*

I'm sure you know that questions that begin with these words are **open questions**. They help you draw people into a conversation, because, as opposed to closed questions, they can't be answered with a simple yes or no.

There's just one of these words you need to be a bit careful with - "why". In a mentoring conversation one of the best things you can do is explore "why" but if you ask it the wrong way, people can become defensive and try to justify themselves. They can become stuck, even more entrenched in unhelpful or limited thinking. Most "why" questions can be rephrased: "what is it about that puts you off?" If your tone of voice implies curiosity, respect and interest rather than judgment, their response is less likely to be defensive.

Some of you may remember the famous Professor Julius Sumdemiller stimulated the curiosity of a generation with his science experiments when he asked "Why is it so". So it's with a sense of curiosity, respectful interest and collaborative exploration that we find ways to ask what's behind someone's thinking, what's important to them, what's motivating them.



It's important to follow up open questions with **probing questions** that ask for deeper thinking and self-awareness. Probing gets a person to talk more. You might say: "Caitlin, I noted that you said earlier ..." then say:

"Can you tell us a little more about that?"

"Would you expand on that idea?"

"Perhaps you'd like to share ...?"



One very useful strategy for getting there is a technique called **cushions**. Cushions soften a confronting question. You combine these phrases with rapport building, non-verbal communication to gently preface a confronting question. This reduces the chance of sounding like an interrogator. For example:

"Do you mind if I ask ...?"

"I'm wondering ...?"

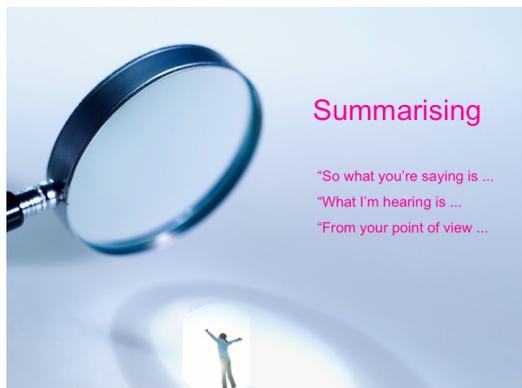
"would you like to tell me ...?"

And, finally, **summarising** questions check for understanding.

"So what you're saying is ...?"

"What I'm hearing is ...?"

"From your point of view ...?"



# Listening



If you ever felt your mind wandering when you meant to be listening, you are not alone!

Our wonderful brain will go and do what brains do when they are not fully focussed. The brain is very good at screening out background sounds. If you are not actively listening, what a person says can easily fade into white noise. You miss it. Your ears take in the sound it but the message is lost.

Because ears hear sounds all the time, listening is an activity that requires conscious effort. It's been suggested that conscious listening even has health benefits for the listener.



## Reductive

Listening for ...

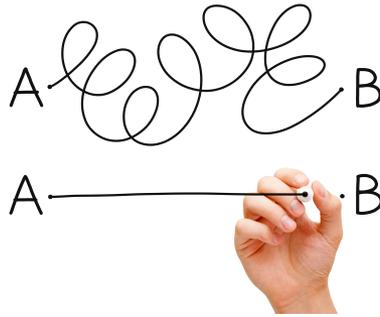
relevance  
focus  
decisive

## Expansive

Listening with ...

ideas  
journey  
thoughts emerge





There are two types of conscious listening. **Neither, by itself is enough in a mentoring conversation.**

**Reductive** listening reduces everything down to what's relevant and discards everything that's not. It's a very useful form of listening that allows you to zero in on a problem, cut to the chase and be decisive.

**Expansive** listening explores ideas. The focus is on the journey not just the destination. It is also a very useful form of listening because it allows thoughts to emerge, people think out loud.

**Either type of listening if over-used can be detrimental to mentoring.**

People using reductive listening often jump to conclusions, or give a solution too soon. Over use of reductive listening short circuits the development process and can impair the mentoring. The way to use this type of listening with **reflection** and **feedback** that allows you to **check** the accuracy of your perceptions.

The downside of expansive listening is that it takes longer, the conversation may wander off-track and it not may seem purposeful.

You really need to use both types of listening in a mentoring conversation. Expansive listening helps you understand each other, get to real issues not just superficial matters. It is very important for reflection and generating possibilities. Reductive listening helps you summarise, highlight issues ensure people make informed decisions and commit to action.



# Got more questions?

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Webinar and ebook by Ann Rolfe, Founder: Mentoring Works  
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Works