

Embedding Indigenous Accelerated Learning Techniques into Programming

Damian Adamski
Te Wānanga o Aotearoa
Damian.adamski@twoa.ac.nz

ABSTRACT

This paper will discuss a possible new way of teaching programming to students. The paradigm of teaching requires a shift away from traditional methods to a new epistemology where learning is designed to match basic human functions, needs to take its place – Ako Whakaterere. This transition is required because while the knowledge of how humans learn has developed over time the teaching methods for programming still often remain a lecture based learning experience. These methods of learning need to be explored and valued in the context of programming. The objective of this paper is to discuss and explore additional methods for teaching to meet the diverse needs of learners.

Keywords: Accelerated learning, Ako, Teaching methods, Programming language

1. INTRODUCTION

Te Wānanga o Aotearoa has been running successful Māori language programmes for over ten years. The pedagogy behind the success of these programmes is Ako Whakaterere; a synergy between traditional Māori learning and western paradigms. At the core of this pedagogy are the underpinning philosophies that focus on understanding the learner's way of knowing which then determines how the material is delivered, the mental welling of the learner is central to their success and anyone can succeed.

This paper will attempt to map the Ako Whakaterere model by first describing what the model looks like and then apply that model to a possible programming class environment. There is no right or wrong answer on how a class should be however the example will highlight an ideal based on the Ako Whakaterere model.

To implement this model a shift will need to occur around how programming is taught. Current teaching methods such as lectures, labs and reading have not achieved desirable results since the failure rate is high.

2. AKO WHAKATERERE

Te Ako Whakaterere is a learning pedagogy developed at Te Wānanga o Aotearoa in the 1990's. The model uses a mixture of learning styles to create a holistic approach to learning a language (Lambert & Lewis, d.n). This model is been used at TWoA to teach te reo (the Māori language). TWoA saw that orthodox learning strategies at that time could be improved and they believed that a Māori based model with the addition of other learning pedagogies would be more like how Māori would have learnt prior to the colonization of New Zealand and there fore may be better suited for Māori learning today (Lambert & Lewis, n.d.).

Sections 2.1 and 2.2 show a breakdown of the model and the theories behind the pedagogy of Ako Whakaterere. However Ako Whakaterere is always improving and new concepts around learning are continuously being investigated. One of these will also be discussed, along with a brief outline of the core elements of the Ako Whakaterere model to give an insight into the essence of what Ako Whakaterere can offer.

2.1 Suggestopedia

The first model used was around the work of Dr Georgi Lozanov. Lozanov developed a new pedagogy called "Suggestopedia" (Lozanov, 1979). Suggestopedia uses, as the name implies, suggestions to enhance the learner's experience. This technique is not manipulative or uses

hypnotic techniques yet targets the learner's psychophysiological mechanics that inhibit a person to learn. For example, an adult, who is a 'second chance learner', may come to their first class carrying a lot of "baggage" that could sabotage their ability to learn. The Suggestopedia objective is to get students to reframe their thinking into something more positive.

Seven laws of Suggestopedia are

1. Love (humanistic love) – To have love and trust between the teacher and student
2. Freedom – To choose to do something or not and to be spontaneous and to learn how they wish to learn
3. Conviction of the teacher that something unusual is taking place – To empower the learner to think that they are self-learning
4. Manifold Increase of Input Volume – Increase the amount learnt. To reject the norm of what is required
5. Global-Partial, Partial-Global; Partial through Global – Understanding the whole context of an event and how it relates to other events
6. The golden proportion – When harmony exists between the learner and the sum of all that is required for successful learning
7. Use of classical art and aesthetics – Creating a peaceful learning environment free from distraction (Unknown, 2009)

Lozanov (1979) used music to increase levels of learning. Additionally Lozanov used baroque music that had 60 beats per minute. TWoA uses music for meditation and during periods of learning. Music with beats under 60 will relax the heart and relax the student (Lozanov, 1979).

Suggestopedia has a four stage cycle:

- Stage 1 – Introduction: the teacher reads out a script and uses their personality to bring life to the material
- Stage 2 – Concert session: students stand and recite back the script several times with the tutor. The tutor will read the script again and this process is repeated
- Stage 3 – Elaboration: students take ownership and the tutor directs when required
- Stage 4 – Production: students communicate what they have learnt

TWoA uses what could be referred to as “weird and wacky” scripts in our classrooms to teach te reo. Some of these are short and some can be relatively long. Repeating these scripts as a class, in groups and with the tutor creates an affiliation with the text while the “wackiness” of the theme makes them memorable.

2.2 Total Physical Response (TPR)

Professor of Psychology James Asher developed TPR when observing children who were learning a first language. (Asher, 2000). He noted that language was command based in the way that something was said and the child would respond. Doing what is said, is reinforced by the action associated with the world

At TWoA, kaiako (tutors) use props and actions to enforce the language been taught. Scripts are acted out often with actions that are associated with the text. Learning is more relevant to the student when teaching a student what a pen is in te reo you actually have a pen in hand and show its use.

3. THE HUMAN BRAIN

3.1 Triune model

The Triune model was developed by neuroscientist Paul MacLean. (Maclean, 1990). This model highlights how the human brain functions in three core conscious levels. These three functions are required to ensure that the human species survived the dangers of life However, when the environment changed, so did the human brain change to allow humans to interact with the new complexities they faced (Phelps, 2013).

The Reptilian brain is the most primitive in nature. As the name states, the behavioural functions associated with this are primary around ‘fight or flight’. Aggression, dominance, territorial and ritual behaviours are, according to MacLean (1990), basic human traits that are much the same as low level animal traits.

The Limbic system was a revolutionary step forward in the human brain and this allows humans to feel and express emotions (Phelps, 2013). This part of the brain controls chemical release into the body so that emotions can be felt and expressed. In essence this part of the brain controls feelings, moods, memory and hormone control and this will be elaborated on further in my paper.

In the evolution of the brain, the Neocortex is a relatively new part and is complex. Creativity, logic, memory, language, analysis and intuition all function in this part of the brain. This is the most advanced part of the human brain and even though each part of the brain is connected, this part of brain controls all the other functions (Phelps, 2013).

Knowing how the brain functions can give insight into how a learner learns and feels. When a student is operating in the neocortex of the brain they are open to learning. However if a student operates in either a reptilian or limbic mental state then learning would not occur as easily. Imagine a student who is about to get evicted from their flat or a student who had a family member die or has broken up from someone they loved. These people would be operating in a lower brain function and they may find it difficult to learn.

At TWoA we are aware of this phenomenon. Kaiako especially those who teach with the Ako Whakatere method, assess their students as they enter the class to evaluate what mental state they in. Are they in a positive learning space or are they distracted and operating in other parts of the brain? A mood indicator on the board can help share with others how a student feels. If the students, in general, are feeling down then learning activities designed to lift the student up into a higher

learning state are delivered. Sometimes, the line between tutor and social worker can become blurred.

3.2 Brain Chemicals and Hormone control

Simon Sinek is a writer and speaker who talks about what makes a great leader. In a speech titled “Why leaders eat last” he explains how human behaviour is based on chemical reactions and how people are in the search of ‘chemical highs’. Feelings of success, according to Sinek, are controlled by a chemical that has been released into the body. Each chemical has a purpose and some can become addictive. Even though this is not a part of Ako Whakatere but is worth noting since it relates to the human brain and general wellbeing. Below is a list of the chemicals and a brief of what they do.

Endorphin – controls and masks pain while creating positive feelings.

Dopamine – the pleasure centre giving off rewarding feeling but can be very addictive.

Serotonin – helps to create leadership and induces feelings of pride and status. Reinforces relationships between people

Oxytocin – promotes feelings of love and trust.

To know what triggers the release of these chemicals would allow tutors to influence how the students feel and reacts in the classroom. A tutor could facilitate deliberate acts of success where students are given rewards, have feelings of pride, status and trust. These feelings would then create more student engagement. Students cannot always exist in the euphoric state and the act of learning must also bring the student back to a relaxed state.

3.3 Left Brain verses Right Brain

Left brain verses right brain learning is a psychological learning model and it is broken down in table 1 below.

Table 1

Left Brain	Right Brain
Language	Recognizing faces
Logic	Expressing emotions
Critical thinking	Music
Numbers	Reading emotions
Reasoning	Colours
	Images
	Intuition
	Creativity

Essentially programming is a left brain dominated profession where critical thinking, reasoning and number literacy are the primary brain functions. However, it is possible to assume that for right brain people these brain functions are not their preferred skill, hence, programming would be a difficult task for right brain people.

Programming is not seen as a creative task in the same sense as acting or art is, but programming is the creation of something from nothing. Creating an application to count stars and/or animating a website are both creative based activities. That is, a programmer creates something that is visual and interactive and these are inherently right brain activities.

Programming, as a rule, is taught from a left brain environment where critical thinking and functional activities are taught. Let’s for a moment imagine a typical programming classroom where students sit in a square institutionalised classroom where creativity is limited. The left brain person would not notice the space and have little interest in their

surroundings. The creative person may have already had their creative ability dampened as soon as they entered the room. Since programming is functional in nature and not seen as creative in its nature those who are left brain learners will do well in this environment. The right brain learner will feel alienated before they even sit down in their chair.

Google has challenged this, along with other companies. They have created right brain working environments so that the creative side of the brain can flourish (Google, 2014).

TWOA test who is right brain or left brain in the class. This allows for students to be grouped according to their preference and teaching can be targeted to which side of the brain is most receptive to the learning exercise.

4. LEARNING STYLES

Every learner learns differently. Understanding the learner's learning style is important so that teaching resources can be created to meet that person's natural abilities (Lambert & Lewis, n.d.)

4.1 V.A.K (VARKT)

Visual, Auditory and Kinaesthetic (VAK) focuses on learning via the sensors and assesses which preference a learner has. This accelerated learning technique is designed to test a student's learning preference so that the teacher can teach to their preference (Gardner, 1993). Visual learner's learn by using their eyes both for reading and for observing the world around them whether that be in the form of graphs and video. Auditory use their ears to hear the learning. While a Kinaesthetic learner learns best by touching and movement.

The level of effectiveness of this model should not be overstated. People are generally aspects of all the learning styles and the learning involved may be task specific. However to ignore the preference of any learner will put them at a disadvantage. For example, if a class is full of kinaesthetic learners and a teacher teaches by using auditory methods the class may quickly become uninspired.

It has been a long held assumption at TWOA that Māori learn best by movement and by listening to stories. Hence cultural customs like waiata are important since this involves singing and moving to the words about the topic they are learning. Memory was traditionally developed through whakapapa chants which are inherently an auditory experience.

4.2 Seven Intelligences

Howard Gardner, a Harvard developmental psychologist, defined seven distinctive intelligences. Gardner (1993) believes that there are many ways to see, understand and interpret the world. His model challenges traditional learning methods that are still found in 'modern classrooms'. The seven are distinctive intelligences are:

Visual Spatial – intelligences around physical spaces. These people prefer to work in the field of arts and with models. Understanding the environment allows these people to construct physical things.

Body-kinaesthetic – like kinaesthetic learners in the VAC model, these people have the ability to use their body to learn and to create. Mechanic's, gymnasts and dentists have a greater understanding of their body and use movement to learn and communicate.

Musical – retain and learn by turning information into lyrics or rhymes. These people require background music to learn.

Interpersonal – students learn through interacting with others and spend a lot of their time focusing on the need of others.

Intrapersonal – these learners learn by self-reflecting on what they have done and by reassessing their own goals. These people have a strong personal will.

Linguistic – use words to describe their world. These learners enjoy reading, listening and talking about ideas.

Logical and mathematical – conceptual, reasoning, calculating and abstract thinking. These people enjoy learning logically and completing research.

Lambert and Lewis (n.d.) state that teachers teach to their learning style and that their style may be contrary to the students. Programming fits into a logical and mathematical paradigm. Students who process using these skills would, it seems, do well. Yet this eliminates people who prefer any of the other intelligences. It would be up to the tutor to know how each student prefers to learn and adjust their curriculum accordingly.

4.3 The Dunn and Dunn Learning Style Model

In this model there are twenty one elements that are divided across five strands (Dunn & Dunn, 1999).

Environmental

- The effect of sound or no sound
- The amount of light in the room
- Temperature of the room
- Class room layout, décor and informal or formal sitting

Emotional

- How someone is motivated
- Single task vs multi-task activities
- How the information or tasks are structured

Sociological

- Learning alone versus in pairs, in a group, versus with an authority figure, with a group of friends versus a mixture of people

Physiological (physical)

- The majority of students like to move while learning
- Food and drink may need to be taken regularly
- Some people are morning people and some are night people
- Perceptual is the way in which we take things in (VAK)

Psychological

- Learning bit by bit versus getting the whole picture and working backwards
- Right brain versus left brain
- Impulsive versus reflective

This model summarizes the many factors that can affect someone's ability to learn.

4.4 Mindmapping

Ako whakaree also uses mindmaps and cartoons to help learning. Mind mapping was developed by Ingemar Svantesson and Tony Buzan to organise information in the brain into a visual form. The technique of mapping places information into coloured interconnecting tentacles stemming out from one central concept or word (Buzan, 1993). These tentacles have words or images that explain the concept through following a theme based on the previous word. Buzan (1993) argues that this memory or note taking technique better represents how the brain processes information and allows the brain to process large amount of information.

Recalling of information is important for learning a language or programming and Buzan (1993) explains many types of

memory techniques. Mnemonics, active recall, passive review, story system, journey system and room system are techniques that can be used to improve memory. See Fig 1: below.

Mnemonics	Using acronyms as cues to learn and remember large amounts of information
Active Recall	Active searching for information in memory
Passive Review	Passive consolidation of learnt information
Story System	Using key points in a story as cues to learn and remember large amounts of information
Journey System	Using key landmarks in a journey as cues to learn and remember large amounts of information
Room System	Using rooms of a house, allocated with certain types of information, as cues to learn and remember large amounts of information

Figure 1: List of techniques to improve memory

4.5 Cartoon

Cartoons are fun, colourful and are simple in their design. They are short in nature and use visual images and words to develop a learning experience. TWoA uses them to reinforce learning with a humorous image that can be easily retrieved.

5. SUMMARY OF MODELS AND THEORIES PRESENTED

There are many similar themes among the models and theories presented. The positive wellbeing of the student is paramount to effective learning. A student who is distracted and worried about life has family issues or comes into a class with preconceived ideas about their learning abilities is already disadvantaged before they even take a seat in the class. A part of the TWoA philosophy is

To provide support, encouragement and guidance to all learners in their pursuit of personal development, learning and employment. To encourage all learners to learn and achieve to their fullest potential.

This, in conjunction with our value of *Te Aroha* (having regard for one another and those for whom we are responsible and to whom we are accountable) and one of Dr Buck Nin's statements "to care" highlights how our organisational focus is on the well-being of the student.

The environment has a big effect on a learner. Light, temperature, décor and sound can bring a class room to life and bring a student into a receptive space when they enter the room.

Another theme in these models is the brain, *nga kete*, where all knowledge is stored. Knowledge about how the brain functions and how an individual learner's brain functions is paramount if we are to meet the learners needs. Every human is different and every brain obtains information differently (Gardner, 1993, Chapman, 2014). With the use of brain modelling techniques, it is possible to identify a student's learning style so that the teacher can target the learner with material that is more engaging and retainable. The traditional teaching method of lecturing from a podium and students retaining the information would not work for all learners Lambert & Lewis, n.d.).

Being active and having fun while learning is very important. Memorable times in the classroom that are fun and entertaining are easily recalled.

The reward of learning successfully can be an additive drug however the flip side to this, is that failure can be depressant (or a demotivator). Success can come in many forms yet for a student to feel success there is a need for acknowledgement. More often than not success is measured by a mark on an assessment or a grade on an exam. These marks often remain hidden because students are either ashamed of their mark or do not want to be seen as arrogant in their achievement. Success however, can be found in all sort of events; the answering of a question, helping of others in the class, attempting a difficult task and completing homework are all cases where success can be celebrated. For second chance learners success in learning may not be something that they have had experience of before. It is the responsibility of the kaiako to build up or even change the psychological inhibitors that may be ingrained in the learner.

6. A POSSIBLE CLASSROOM

So what does this mean for a student learning a programming language? To answer this question it may be easier to create an imaginary classroom environment that incorporates the learning theories above. This is just one possible example of how an Ako Whakatere classroom would look like, so let us image this:

A student walks into a classroom. The feel of the classroom is important. Ideally the space would be warm, welcoming, full of colour, full of inspiration, and have music playing. Work spaces would be pod based and as far from traditional institutionalised learning space as possible. Breakout space would also exist to allow group work to be done away from the workstation. No office is complete without a coffee machine and water cooler. A relaxed, living and creative space with plants and art work will help put the student into a comfortable ready to learn headspace which will help them be open to retain information.

The learning, either in a one hour or two hour session will be a mixture of highs and plateaus. This is to give the students feelings of success during their learning. However, to ensure that this success does not become overly addictive or lose meaning, there should also be a period of plateau so that the student can go back to the natural state. With this return to a natural state the student would come down from their high euphoric feelings.

Time would have already been given to understand how the learner prefers to learn. Testing the student VAK preference, left or right brain preference, where their operational intelligence lies, maybe a Myers-Briggs personality test and some whakawhanaungatanga (relationship building) will give insight into the learners world view. When sharing in a group each student will begin to understand their own, as well as others, strengths and non-preferred ways of being. Doing such an exercise would break down inhibitions amongst class members, build stronger relationships and allow the tutor to know their students in a more holistic way. As stated earlier, knowing the students and their learning preference will allow the tutor to tailor their lessons, break out seasons and assessments. A class would be difficult to teach if you were teaching programming using left brain techniques when the majority of the class were right brain learners.

The class has arrived, yet assessing your students' mentality type and state continues. Class time, what day of the week it is, whether the All Blacks lost, is it a pay day, how home life is, and the weather all affect the student's ability to learn. Mediation can bring their focus into a learning state. The use

of breathing techniques, music and a relaxed voice leading the meditation will help to ensure that the whole class is in a positive state to learn. The key to any mediation is the sharing of the idea that all who are in the class are in the same mental state. Mediation can also be used to bring students down from euphoric highs.

A mood indicator could also be used to evaluate the student's mental state. A tutor could have a vertical line on the board with 'happy positive' on the top and 'grumpy negative' at the bottom and individual class members place their name in the scale. The scale can be used to assess other emotional or mental states and the student should have the ability to change their place on the scale during the lesson. This has multiple purposes for the tutor. It allows the tutor to evaluate the needs of people in the class while also giving an instant evaluation of how the tutor is performing in the class. A class success does not have to be an event where everyone understands the 'for loop' but may be more about moving from a negative emotional state to a positive emotional state.

Programming can be like a puzzle where the pieces are delivered one at a time. Such teaching can be troublesome for the global learner since they may not understand how this new feature relates to the bigger picture. Ideally, to help all those partial and global learners each new idea needs to have a context in relation to its direct parts and with the grand picture. This is so the global and partial global learners can see and understand the logic of the new concept.

Memory techniques can be used to help students remember code. Mnemonics and story, journey and room systems for memory recall could be used. These would require creative writing and thinking to transfer code sequences into physical items. Imagine a house full of items that relate to a programming code. A student could develop simple programmes by walking around their house in a set sequence.

Scripts can also be used for learning languages. They are normally bizarre so that the extreme nature of the language can be more easily retrieved. For programming the script could even be in pseudo code or an actual code. This again would require some creative writing and thinking yet logical sequenced events could be represented in a script. A script could also be used to teach logic and ethics. The theory is that by repeating and acting out these scripts, students according to Lozano (1979) will have a better chance at remembering the language.

Collaborative work will build whakawhanaungatanga among students where they can support each other in their learning. Learning and the completion of exercises could be done in groups so that students teach and support each other in teams. Knowing that you are not alone will help those who find it difficult and those who know the subject can get a sense of accomplishment by helping others. Collaborative versus individual learning has been proven to be a more effective way of learning (McDrury & Alterio, 2002).

7. CONCLUSION

The responsibility of the tutor to facilitate the student learning and to understand the learner's needs is paramount to the success of the Ako Whakarete teaching methodology. Teaching under this model requires a fundamental shift away from traditional 'chalk and talk' teaching to a space where the student wellbeing and their individual learning needs become central to the process of teaching and learning.

This discussion paper gave a brief examination of the Ako Whakarete model used by TWoA and applied this pedagogy to a future programming learning environment. The next step for the author is to create resources that allow for the implementation of the learning model into an actual programming

classroom and to gather empirical evidence to evaluate the effect of embedding Ako Whakarete into a programming class.

This paper seeks to encourage more exploration by kaiako, tutors and curriculum writers to develop and implement multiple learning styles that better meet the needs of not only Maori students but also all students in the 21st century.

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