DISCOVERY LEARNING

Principal Sabbatical Report

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Acknowledgments

Executive Summary

The focus of this sabbatical was to investigate examples of Discovery Learning Theory within the primary education sector. This included research into the theory itself, examples of New Zealand best practice and a visit to Brightworks in the United States.

http://www.sfbrightworks.org

Key Inquiry Questions

How does Discovery Learning Theory align with the NZ Curriculum - with a particular emphasis on the Key Competencies? (1)

How can Discovery Learning Theory be better integrated within the Essential Learning Areas? (2)

What BEST practice examples of Discovery Learning Theory (with a particular emphasis on Science & Technology) are resident in New Zealand? (3)

How does Discovery Learning Theory align with our vision for the children of Hororata? (4)

How can Discovery Learning Theory be successfully applied to improve the learning outcomes for the children of Hororata? (5)

Rationale

As part of the school's self-review process, we identified 'equitable coverage' of all of the Essential Learning Areas as a significant area of development for the school curriculum. This imbalance has seen the 3R's dominating our curriculum at the cost of the other learning areas, and has seen student achievement in these areas decline.

In an effort to correct this we endeavoured to promote learning in Science and Technology within our school curriculum and took some deliberate steps towards implementing a blend of Discovery Learning Theory strategies, in particular S.T.E.A.M (Science, Technology, Engineering, The Arts & Mathematics) and Tinkering learning programmes. This shift in learning theory has seen a pedagogical shift at Hororata from knowledge to experiential based learning and has seen redesign of the school's 'Learning Culture'.

This, alongside our 'Active Culture' have been important ingredients in re-branding our school and giving us a point of difference within our rural learning community. This has been a strong strategic focus for our school and community for the past 3-5 years.

On review this has seen some significant gains at the senior end of the school (Yrs 4-6), but has made little in-roads into what is taught at the junior end of the school. We now need to take some deliberate steps towards formalising this approach as the foundations to our 'Learning Culture'. This requires a deeper understanding of the theory; stronger leadership and greater engagement by staff.

The purpose of this leave was to enable me to deepen my knowledge and understanding of Discovery Learning Theory; provide the school with a stronger vision for learning; enrich the school curriculum and ultimately improve the learning outcomes for students attending our school.

At a personal level the opportunities made available through this leave fueled my passion for discovery learning and the delivery of Science & Technology in the primary sector.

At a community or national level, the opportunities afforded by this leave enable our school to achieve better alignment with the Key Competencies and go a long way towards developing confident, connected life-long learners.

Methodology

To successfully undertake this research project and answer the Key Inquiry Questions, I collected a lot of information from the world-wide web for which I dedicated time each day to surf the internet to find exemplars of good practice pertaining to my area of focus.

In addition to the research conducted online, I visited Brightworks in San Francisco, USA, where I was able to witness first hand constructivist learning theory in practice. My original intention was to connect with Gever Tully the founder & architect of the Tinkering School and Brightworks learning philosophy. Unfortunately due to unforeseen circumstances I was unable to meet with Gever, instead spending time with Liz Jaroslow, the Head of School at Brightworks San Francisco. Liz gave me a guided tour of Brightworks School; facilitated talks with students and teachers/ collaborators and provided me with an insight into the Tinkering School philosophy and how it sits within the education system.

This research enabled me to develop a clear understanding of the philosophy and pedagogy behind discovery learning; find examples of discovery learning in practice within New Zealand and abroad, and to begin the journey of designing a localised school curriculum particular to my school and community.

Findings

What is Discovery Learning?

Discovery learning is an exciting, activity-based programme that provides a vehicle for teachers and students to explore curriculum learning and key competency development, in an authentic, fun, challenging and student-directed context.

The "Discovery Model" emphasises hands-on learning, play & exploration. It has influenced everything from museum design to early childhood education.

Discovery Learning Theory is closely linked to the work of Jean Piaget and Seymour Papert and their constructivist/constructivism learning theory. It is an inquiry-based practices that takes place in problem solving situations where learners draw on their past experience and existing knowledge to discover facts and relationships and new truths to be learned. Students interact with the world by exploring and manipulating objects, wrestling with questions and controversies, or performing experiments.

By encouraging active participation, hands-on learning helps students to have fun, gain confidence & remember more. Rather than passively consuming facts from a textbook or lecture, a child can connect those facts to something that they can see, touch and affect.

By empowering a child to take a hands-on approach, you are helping them to think cognitively, creatively and critically. You are helping them to make observations; be curious; to test; to repeat; to draw conclusions and to ask questions of "How else can I apply this?"

Key Inquiry Questions

How does Discovery Learning Theory align with the NZ Curriculum - with a particular emphasis on the Key Competencies? (1)
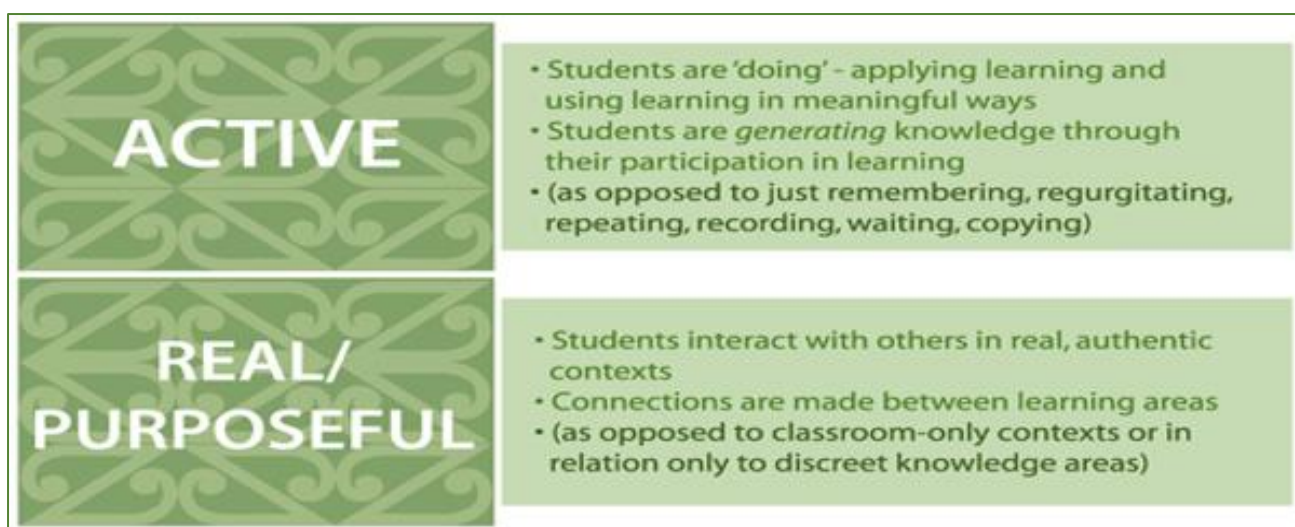
'Key Competencies are the beating heart of education' - Guy Claxton
        …they are the very essence of Discovery Learning.

Key Competencies (KCs) underpin everything that happens in teaching and learning. They have implications for all aspects of planning and teaching, including:
- activities, resources, and language used
- content, topics, or foci for learning
- the role that both students and teachers take in the learning process
- the culture of the classroom and school.

Principles that underpin the key competencies
The diagram below identifies four principles that underpin the key competencies and lists indicators to describe what we might see when key competencies are embedded in teaching and learning. Teachers can use this diagram to reflect on their own classroom practice and identify areas for development. Leaders can use this diagram to consider how key competencies are developed and monitored in teaching and learning across the school and if curriculum change is needed.

ACTIVE
- Students are 'doing' - applying learning and using learning in meaningful ways
- Students are *generating* knowledge through their participation in learning
- (as opposed to just remembering, regurgitating, repeating, recording, waiting, copying)

REAL/ PURPOSEFUL
- Students interact with others in real, authentic contexts
- Connections are made between learning areas
- (as opposed to classroom-only contexts or in relation only to discreet knowledge areas)

RELEVANT
- Learning is relevant to students' lives now and also supports their development as life-long learners
- (as opposed to learning relevant only to a limited range of possibilities from the past)

EMPOWERING
- There is attention to developing students' learning dispositions - their desire, inclination and will to learn
- (as opposed to a focus on complying with instructions, reliance on only teacher-directed, teacher-driven, teacher-prompted learning)

Discovery Learning Theory aligns very well with the Key Competencies. It has a strong emphasis on the development of skills necessary for life-long learning; skills that are transferable across the curriculum and skills that have real and authentic applications in a student's life.

- It puts the learning of Language, symbols and texts into context; gives it relevance and coherence with future learning, and promotes reading, writing and counting as tools to help students investigate and understand the world around them.

- It provides students with the opportunity to be creative, critical and altruistic thinkers. Thinkers who are able to reflect on their own learning, draw on personal knowledge and intuitions, ask questions, and challenge the basis of assumptions and perceptions. It encourages students to be competent thinkers and problem-solvers actively seeking, using, and creating knowledge and skills

- It allows students to manage themselves by being resourceful, reliable, resilient and striving to achieve their personal best.

- It develops in students skills for interacting with and relating to others. Students who relate well to others are open to new learning and able to take different roles in different situations and allows students to participate and contribute as a group member, to make connections with others and to solve complex problems.

How can Discovery Learning Theory be better integrated within the Essential Learning Areas? (2)

The traditional model for the delivery of the Essential Learning Areas see learning areas often delivered in silos or through learning experiences that are often knowledge based rather than skill based. We find ourselves as teachers topping children up with knowledge with little emphasis on the development of skills that are transferred into a child's life. There is often little coherence between what a child is learning and the application of this new learning into authentic real life situations.

Discovery learning effectively unpacks learning backwards, emphasising the development of transferrable knowledge and skills. The Essential Learning Areas are viewed as necessary tools for children to access learning and are applied in authentic/real world situations.

The discovery model aligns very well with the NZ Curriculum. The main difference is that it has a strong emphasis on the development of skills necessary for life-long learning; skills that are transferable across the curriculum and skills that have real and authentic applications in a student's life.

What BEST practice examples of Discovery Learning Theory (with a particular emphasis on Science & Technology) are resident in New Zealand? (3)

There are numerous examples in New Zealand of Discovery Learning Theory being applied to adapt the NZ Curriculum.

Many of the models labelled as Discovery are play based models observing discovery pedagogies inspired by the Reggio Emilia philosophy focusing on the development of science capabilities in younger students. These models use discovery time as a timetabled opportunity whereby students participate in a hands-on activity-based programme.

Other examples of Discovery in action, see the school curriculum transformed, with significant portions of the timetable and annual learning plan dedicated to Discovery Learning pedagogy. These programmes provide a real-world, relevant context for learning in all learning areas through discovery, enquiry and exploration.

The aim of these programmes is to make learning deep, meaningful, challenging, hands-on and enjoyable. The model provides opportunities for traditional subjects such as reading, writing and maths to be applied in real-world situations.

The example that best relates to our context and environment here at Hororata is that of Hukerenui School in Northland. The school situated on a generous 4.54 ha grounds has developed what they refer to as the Real-life learning model, which has close links to constructivist, discovery and hands-on learning theory.

With the support of an enthusiastic local community, Hukerenui school students have grown and sold maize, reclaimed a plot of native bush, planted lavender gardens, made natural remedies, developed the existing beehives and used the beeswax and honey to produce balms, planted an orchard, and developed a paddock where they now graze alpacas. They collect alpaca poo for their budding fruit trees, make fragrant hand creams and lip balms from their own lavender and manuka, and learn about sustainability and social enterprise in a totally hands-on way.

The model has strong foundations in Science, Technology and the Social Sciences and successfully integrates the more traditional essential learning areas such as Reading, Writing and Mathematics as tools for learning rather than subjects in their own right e.g., If the paddock needs some fertiliser, students have to calculate how big the field is and how much fertiliser they need to get.

How does Discovery Learning Theory align with our vision for the children of Hororata? (4)

In promoting our Learning Culture at Hororata Primary School we want to encourage our children to 'Think Outside the box'; to use flexibility, creativity, innovation, and social intelligence to solve every day problems. Our teaching provides children with learning experiences that include elements of Developmental, Discovery, STEAM and Tinkering learning theory, with a strong emphasis on Science and Technology.

Needs and considerations:

- Learning in Science & Technology is highly valued by the school and has a prominent part in the school curriculum.
- Learning experiences are designed to provide students with opportunities to apply knowledge and skills, learned through the 3R's - **reading, writing**, and **arithmetic;** and to practice and develop skills in the 4C's - **creativity**, **critical thinking**, **communication**, and **collaboration.**
- Learning experiences should encourage natural curiosity and enthusiasm and promote exploration, discovery, problem-solving and creative thinking.
- Learners will be competent users of the basic Science Process Skills: Observation; Communication; Classification; Measurement; Inference; Prediction.
- Learning should
    - ignite interest in learning (fun);
    - enhance knowledge and understanding of previous learning (educational);
    - encourage exploration & discovery through experimentation (hands-on);
    - build confidence, collaboration and communications skills (collaboration);
    - provide opportunities for inventive problem-solving.

The school curriculum has been designed around our vision, values and principles and a metaphoric representation of the "Five Pillars of Learning"- Key Competencies. The Five Pillars forge a coherent link between our vision, values and principles.

The essence of Discovery Learning Theory runs through the veins of the school curriculum and is rooted in teaching pedagogy and the school culture. What is missing in the current model are authentic learning as the discovery based learning experiences offered are rather sporadic and are often tagged onto broader whole school collaborative learning themes with little coherence between levels of the school and future learning outcomes for students.

How can Discovery Learning Theory be successfully applied to improve the learning outcomes for the children of Hororata? (5)

The Hororata Discovery Learning Model will provide a real-world relevant context for learning in all learning areas through discovery, enquiry and exploration. The aim is to make learning deep, meaningful, challenging, hands-on and enjoyable.

The Hororata Discovery Learning Model will…

- promote the Key Competencies to the forefront of the curriculum.
- promote a stronger focus on the development of transferable essential skills.
- provide learners with the opportunity to learn through real-world situations.
- provide learners with experiences that have relevance to their learning now and in the future.
- strive to make learning meaningful for our students
- acknowledge student diversity by fostering and nurturing students to understand and build on **their** strengths.
- allow students to work independently in their classrooms or with others.
- encourage students to build on their interests and develop social and problem solving skills.

In practice the Hororata Discovery Learning Model will…

- be delivered as part of our Integrated Curriculum (Discovery Time).
- be introduced at all levels of the school through age appropriate project based learning experiences e.g., Calf Unit; Poultry Unit; Horticulture Unit.
- see **Learners** involved at all levels of the learning process.
- see teachers engaged as **Learning Facilitators** within and across learning projects e.g., teacher expertise will be shared across all projects and is not specific to the area of the school in which they teach.
- see parents engaged as **Learning Partners** to work alongside students to undertake some of the more physically and mentally demanding tasks associated with each learning project e.g., construction of facilities etc.
- see local industry engaged as **Learning Advisors** to support students with various aspects of the model e.g., financial, animal health, property development, marketing etc.

HDL Model Pt. 1

Strategic Thinking

The HDL Model will be rolled in out in three units. Each unit is mentally and physically appropriate to the targeted age group and has sufficient flexibility to build upon from year-to-year i.e., Discovery Learning Units: Horticulture Unit - Junior School; Poultry Unit - Middle School; Calf Unit - Senior School.

HDL Model Pt. 2

Action Planning

Each component of the HDL Model is broken done into three stages i.e., Stage One - physical environment; Stage Two – support structures and Stage Three – learning objectives.

Stage One

- The construction component of the project focusing on physically setting up the environment to work within e.g., Calf Unit – feed, fencing, shelter, water.
- The main contributors to this stage are the Learners and Learning Partners.
- One-off cost in terms of money and time (Year One) after which the priority shifts to the maintenance of the facility.

Stage Two

- The management component of the project focusing on bringing together all the essential resources necessary for the project to operate e.g., sourcing, feeding, caring for and selling calves.
- The main contributors to this stage are Learning Partners and Advisors.
- If managed well in advance all essential resources will be secured before the actual operational side of the project commences.

Stage Three

- The teaching component of the project focusing
- on translating all of the management components of the projects into learning objectives, effectively engaging students in the management and operation of the project.
- The main contributors to this stage are Learners and Learning Facilitators.
- Learning Objectives will relate to each piece of the Learning Jigsaw below.
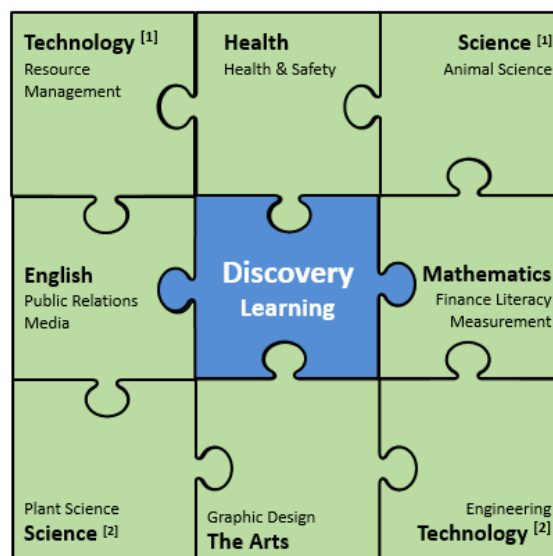
HDL Model Pt. 3

Sustainability

The greatest risk to the HDL Model is that it is a 'flash-in-the-pan' and that it becomes a one off event in the history of our school. For this model to be truly sustainable and have an ongoing impact on learning at our school it needs to be easily adaptable and have strong links to the real world. A longer term vision of how the model can grow each year is essential as the hype of Year One – the establishment year, fades away moving forward.

Implications

The findings of this research project confirm the need to further transform the school curriculum to truly reflect the teaching philosophy behind Discovery Learning Theory.

It is evident that despite having a strong, documented vision for learners at Hororata Primary School; a vision that identifies Discovery Learning Theory as an important ingredient in preparing learners for the future, that in reality our curriculum lacks substance and that learning theory isn't embedded deeply enough in the school's learning culture…we are not walking the talk.

On the surface there is a taste of the new learning theory in the school curriculum, however teaching pedagogy doesn't reflect this and the theory itself doesn't run deep enough through classroom programmes.

The implications of this research project, are that we now have discovered examples of good practice in this field of education; have had the opportunity to learn more about the potential challenges and pitfalls involved in transforming a school curriculum and have had a long hard look at our own curriculum and the steps we need to take to walk the talk.

Benefits

Seven years on from the development and design of our local curriculum here at Hororata, we are faced with the challenge of reviewing and potentially overhauling the school curriculum to better meet the aspirations we have for the young people of Hororata.

During my leave I was able to have an honest look at what we do around here; to assess how far we have drifted from the educational ideals we invested in the Hororata Curriculum back in 2010 and to further personalise the NZ Curriculum to better meet the needs of our learners.

The discovery, enquiry and exploration I have invested into this research has motivated me to delve deeper into Discovery Learning Theory; to change my approach to how we can implement Discovery Learning in our school and to develop a more robust, sustainable long-term model.

The benefits of this research project to myself, school and community are:

- My passion for discovery/constructivist learning theory has been heightened through my findings of good practice in this field and my visit to Brighwtworks USA.
- My school curriculum has been thoroughly reviewed and the Key Competencies have been brought back to the forefront of the curriculum. A new direction has been established for our school and the learning journeys of our students has been better defined.
- My community have embraced the new learning approach, resulting in greater parental/community involvement in our school.

Conclusion

This study confirmed my assumptions about the value Discovery Learning Theory has in the education and the advantages this kind of teaching and learning approach can have in preparing our students for the future.

It is evident that the authentic real-world learning experiences embedded in the Discovery Model, better equips our students with transferable life skills necessary for future learning and enables them to apply learning from other areas of the curriculum in a more purposeful way e.g., Mathematics – measurement, statistics, financial literacy.

The philosophy also promotes the Key Competencies to the forefront of the curriculum and utilises the skills within them as tools for learning, opposed to subjects for learning. This in turn transforms our curriculum from a knowledge based to skills/strategy based curriculum, which better equips our students for the future.

In essence when our school introduced our local curriculum in 2010, we did so under the illusion that we had taken the best bits out of the NZ Curriculum; left out what was not relevant to our context and in the process developed an innovative curriculum that best meets the needs of Hororata students. In all honesty we left very little out, falling into the 'must achieve coverage' trap, effectively implementing a very National Standards compliant curriculum.

The documentation at the foundation of our curriculum talks of the Key Competencies being the 'Five Pillars' of learning here at Hororata and of providing learning experiences that were authentic, real-world and engaging. The truth of the matter is we don't 'walk the talk' and have drifted back to a very safe and compliant curriculum.

This leave has motivated me to re-visit the ideals we wrote of in 2010; embed them more deeply in what we do around here and work harder on the connections we build between students and their learning; teachers and their students and our community our school.

Moving forward we need to develop a shared understanding of the why, what and how Discovery Learning sits within our curriculum and we need to implement a more sustainable model which is consistent, coherent and responsive to the changes and challenges ahead of us.

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