

To further develop an understanding of how Science can support improved learning outcomes for Pacifica and Maori

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Executive Summary:

Many challenging factors impact on primary schools ability to deliver the science curriculum to their students. The outcome of this research is consistent with wider research. Teachers ,students and Principals' have identified significant factors that contribute to the impact of literacy learning outcomes of Pacifica and Maori students using Science as a vehicle for success.

Some schools have strategies in place to further develop the effective teaching and learning of science using science activities that resonate with the lives and culture of their students but many schools have not realised the importance of science as a learning area to support literacy, numeracy and the key competencies.

For schools who are using a teaching and learning approach that has inquiry at its heart and has a link to literacy, in particular writing, inclusive of the cultural aspects of the student's lives, demonstrate improved attitudes to learning and improved learning outcome in literacy.

However, I believe that the delivery of the science curriculum has untapped potential to facilitate improved learning outcomes in literacy for all students and especially for Maori and Pacifica.

PURPOSE:

- To review the implementation of science across a variety of schools.
- To investigate the implementation of science in schools overseas that has an indigenous perspective.
- Collect personal voice from students in relation to learning in science.
- Identify how science can sit alongside the culture of Maori and Pacifica.

RATIONALE:

To establish a connection between the teaching of science and improved learning outcomes for all students particularly Maori and Pacifica in literacy and numeracy.

BACKGROUND:

The journey began in the spring of 2012 in the NZEI magazine SCHOOL NEWS. There was a very small piece of writing about a senior lecturer at Waikato University Dr Anne Hume, who expressed her enthusiasm for a new science resource and encouraged us educators to view the programme. So.....

Many factors influence the delivery of the Science curriculum in primary schools for all students. The identified barriers to the teaching of Science are still evident in a majority of schools with the introduction of National Standards for literacy and numeracy having a major impact on many of the perceived less important curriculum areas.

- Lack of equipment
- Inadequate budgeting
- Time allocation
- Lack of competence and confidence of teachers
- Lack of a suitable space
- Impact of priority learning areas such as numeracy and literacy.

Ian Milne in an article “A sense Of Wonder, arising from Aesthetic Experiences, should be the starting point or inquiry in Primary Science” 2010.

Defined the challenges as

- The lack of status of science teaching. An NZCER survey results show that only 2% of Principals identified professional development for science as a school focus compared with literacy and numeracy 70% and inquiry learning 50%
- Learning in a crowded curriculum
- Decline in students attitudes

In a working paper written in 2009 by Ian Milne “Is New Zealand Primary science Education in a state of crisis?” he states that;

- “The average hours of teaching science reduced from 66 in 2002 to 45 in 2006” for Year 5 students TIMMS 2006.results showed that as a result of the reduced teachings hours for science the achievement of students also declined. Milne. I (p,3 2010)
- “In a 2007 NZCER survey only 2% of principal’s surveyed identified science as a current curriculum emphasis.”
- “TIMMS 1994 – 2006 showed a steady decline that after steady increases in science achievement and thinking between 1994 and 2002 NZ children’s performance returned to levels of achievement similar to those achieved in 1994.” Milne .I.2009

Shelley Peers (2006) states in “Teaching Science” Vol. 53, No. 3 Sept 2007 that “High quality teaching of scienceIs a national priority in order to develop citizens who are scientifically literate and who can contribute to the social, environmental and economic wellbeing of Australia?”

The New Zealand curriculum vision states that we want our students to be “confident, connected, actively involved and lifelong learners.” The wonder and awe of the science all around in our world provides the perfect vehicle for inquiry learning. Read the Sense of wonder by Rachel Larson (1988)

I believe that literacy should have a foundation of hands on discovery. Science provides this platform. As a result of implementing the “Primary Connections” science programme in our school I wanted to find out more about the impact on the learning of the indigenous students in Australia to explore that same possibility here in New Zealand.

METHODOLOGY:

- Undertake professional readings
- Interviewing Principals and lead teachers
- Visiting schools implementing the inquiry learning approach in science in Western Australia.
- Visiting schools and speaking with students

FINDINGS:

Three principals and two deputy principals from Western Australian schools and three New Zealand principals were interviewed for this research project. In some cases the lead teacher responsible for science was able to share the delivery of science in the schools.

The focus in Western Australia was the implementation of the “Primary Connections” teaching and learning programme that was developed by the Australian Academy of Science and was funded by the Australian Government Department of Education in September 2008.

The programme has an important role in linking science to literacy. The development of this programme of teaching and learning was based on current research that identified barriers and provides solutions to the barriers to teaching science in a primary school...

The programme provides

- Professional development for teachers to build teacher confidence in both science and literacy

- Builds capacity for primary teachers to become curriculum leaders.
- Provides resources for teachers that include content and strategies for learning
- Provides student learning resources that support inquiry-based approach to science.
- Links the science with indigenous perspectives “Primary Connection 2008)

In October 2008 a pilot study and report was prepared for the Australian Academy of Science – “Small Study –Big success Story. Primary connections incorporating indigenous perspectives Pilot Study report” (2008)

“In summary of this study of the Primary Connections Indigenous perspective pilot showed compelling anecdotal evidence.

- Increased student engagement and participation in learning
- Improved student self-esteem, confidence and attitude to learning
- Increased student participation and contribution
- Increased student attendance
- Improved student relationships with learning (enthusiasm and commitment to learning.
- Improved teacher attitudes to teaching science and literacy incorporating indigenous perspectives
- Improved relationships and development of partnerships with parents and communities.” (

Robyn Bull. Primary Connections. Project Coordinator / Indigenous Perspective Coordionator.Australian Academy of Science, Oct .2008)

“You gotta tell this story...what I’ve seen going on during the pilot is amazing—I’ve never seen the kids so engaged. It shows that Aboriginal kids are really smart—we’ve just helped them to bridge some gaps. Science is a really powerful way of doing that, because for Aboriginal people it’s a way of life—they are very connected to the land and the environment—which are integral to their culture.”
(Erin Aboriginal Education manager)

“A concurrent study of 1467 students in Years 3–7from 26 government schools in Western Australia and Queensland reported similarly positive results from implementing PrimaryConnections units. The study revealed that students from PrimaryConnections classes achieved significantly higher mean literacies of science, processes of science and some aspects of attitudes to school science than students in comparison classes. Importantly, the higher mean scores for literacies and processes of science were reported for all groups—males, females, students of Aboriginal and Torres Strait Islander descent (ATSI)—students with a language background other than English (LBOTE) and for non-ATSI and non-LBOTE students.

Other PrimaryConnections findings

PrimaryConnections Stage 3 Interim research and evaluation report 15: Impact of PrimaryConnections on students' science processes, literacies of science and attitudes towards science (Hackling and Prain 2008)

<http://www.science.org.au/primaryconnections/irr-15.pdf>

The evaluation revealed that the impact of Primary Connections on students' achievements in literacies of science and science processes was both statistically significant and substantial, as evidenced by the effect sizes. The research indicated that the linking of science and literacy, the explicit teaching of literacies of science and the inquiry-based teaching and learning model that underpins the Primary Connections approach most likely contributed to the enhanced performances of the students from the PrimaryConnections classes."

(Robyn Bull. Primary Connections. Project Coordinator / Indigenous Perspective Coordinator. Australian Academy of Science.) Oct .2008)

One school in Western Australia with 387 students: - 38 / 10% were Aboriginal students and 147 / 38% of students came from 53 different countries speaking 33 languages. The students all came from a very diverse socio-economic area.

Two classes of Year 4 and Year4/5 in 2008 and 4 classes 2x Year 4 Year 5 and Year 5. /6 in 2009 were involved in a High Achieving Aboriginal Students program.

Science was taught in one weekly block of one1/2 – 2 hours per week and the topics were integrated across other learning areas.

The schools I visited also had designated teaching areas solely for science with all the resources on hand.

The impact on the Aboriginal students was;

- The students were excited to participate in Science lessons and often checked to make sure Science would be happening on a certain day. Sometimes stating that "they were happy to come to school today because they knew it was Science day and they really loved doing Science."
- Participation and enthusiasm during sessions by Aboriginal students appeared to have increased significantly.
- They were more enthusiastic to offer their ideas both in group activities and with the whole class.

- When using Aboriginal perspectives activities Aboriginal students tended to lead their group in the activities as they appeared more confident in the content
- As a result of the many discussions there was evidence of improved verbal communication skills.
- Literacy and numeracy levels had increased across all year levels.
- Attendance of students at school had improved.

Another school in Western Australia had the similar results and as well as using Primary Connections they were very involved in an area close to the school – Bibra Lake Reserve.

One of the difficulties for some of the schools visited was that science was taken by a specialist teacher. Teachers in WA have four hours a week non-contact time so science was one of the curriculum areas taken to allow for non-contact time.

Therefore important collaborative conversations were needed to be had to ensure the connection between literacy and numeracy.

21st learning environments were enabling this collaboration to occur in some schools along with creative timetabling and use of personnel.

One of the strengths was that schools with a high number of students had an aboriginal support worker as part of the staff. The support worker was then able to help with the aboriginal understandings of science learning contexts for all students. They were also able to help support the connections with parents and the outside community.

So what is happening in New Zealand? Most principal's I spoke to did not have science as a priority.

Principals of schools outside of Auckland who have a predominant Maori student population shared the importance of the local environment as a basis for Science. Immediately the students are understanding science activities as a part of their everyday lives.

These schools have a science programme based on their environment and life activities (e.g.) white baiting, fishing) activities and the environment (Rivers, swamps, flax, salt marsh, estuaries etc. The science was practical, part of their everyday lives and interwoven with the children's culture.

The National standards results for the students in these schools for reading and writing showed that the majority of Maori students were achieving at and approximately the same numbers of Maori students were achieving above.

IMPLICATIONS:

This is what schools need to do – to develop a science curriculum that is based on science that is around them; in their school environment and in the community outside.

Ensuring that within the collaborative planning of teachers there is a conscious link to Maori and Pacifica culture.

Involving community members who can support the indigenous component of our Maori and Pacifica cultures.

For our school we are surrounded with wonderful opportunities for science learning in our community:-the zoo, Meola reef, Western springs Park, Pt Chevalier beach, the mangroves and The Oakley creek and waterfall.

We have developed the school grounds into a native park and have established gardens for growing of vegetables etc.to support other areas of science learning.

Ensure there is curriculum time for SCIENCE timetabled across the school. Up skill a teacher to be the curriculum leader for science and give this curriculum area the status that it should have.

Establish a space that can be used by all classes for the teaching of science with the
Resources readily available within this space.

BENEFITS

The benefits are not only increased learning achievements for students but students who will value the world around them and become socially responsible citizens of the future ,with an on-going sense of awe and wonder about this incredible world

For Pacifica and Maori students the benefits are that their learning is in a setting that is familiar to them and has a specific link to their own cultural backgrounds and understanding. These students are able to bring their own cultural capital to the learning situation and their communities are able to be engaged in the schools.

For NZ European students the benefits are that they develop a deeper understanding of the cultures of our Maori and Pacifica peoples also. Under the Treaty of Waitangi we have an obligation to ensure that all students have an understanding to Tikanga Maori in our schools.

CONCLUSIONS:

The importance of Science as vehicle to improve student learning outcomes in literacy and numeracy is well documented.

Schools need to be brave enough to review currently the focus of their curriculum delivery and investigate weaving literacy and numeracy through Science, just like the strands of a Kete to fill a basketful with knowledge and develop skills for life.

Understanding the world of science will and has huge impact on this world and everything in it is dependent on us to survive

Mā te whakaaro nui e hanga te whare;
mā te mātauranga e whakaū.
Big ideas create the house;
knowledge maintains it. (www.tki.org.nz)

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