ABSTRACT
        This paper outlines the implementation of a Science
Rally held at Palm Beach State Primary School (Australia) which has a
high proportion of disadvantaged families. Fostering the principles
of multi-age grouping in primary schools, the rally aimed at engaging
children in meaningful and exciting activities in a non threatening
and success oriented setting. Children from 5 to 13 years of age
worked through science problem-solving activities while aiding group
members realize their differences, skills. and abilities. Outcomes of
the rally include: a richer learning environment; an individualized
curriculum; cooperation and support; peer tutoring; good
relationships; positive attitudes and self-concept; success; positive
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team teaching; applicability to problem-solving; and acceptance of
multi-age grouping. (Author/JRH)

# Science In A Multi-Age Environment

## by
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# SCIENCE IN A MULTI-AGE ENVIRONMENT

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## ABSTRACT

This paper outlines the implementation of a Science Rally held at Palm Beach State Primary School. Fostering the principles of multi-aging in primary schools, the Science Rally aims to engage children in meaningful and exciting activities in a non threatening and success orientated setting. Children from five to thirteen years of age work through science problem-solving activities whilst aiding group members realise their differences, skills and abilities. The school has a population with a high representation of disadvantaged families and an average income below the basic wage. Multi-age grouping as a philosophy is particularly suited to the environment and clientele of Palm Beach State School. Outcomes of the Rally include: a richer learning environment; an individualised curriculum; cooperation and support; peer tutoring; good relationships; positive attitudes and self-concept; success; positive results for underachievers, low socioeconomic status or other marginalised children; academic achievement; continuum of learning; team teaching; applicability to problem-solving; and acceptance of multi-age grouping.

## BACKGROUND

The Science Rally at Palm Beach State School was initiated by Stephanie James after an exchange visit to Canada in 1990. Stephanie had seen the concept of a Science Rally developed and applied over a number of years by her Canadian host school.

This concept was adopted, developed and implemented by Palm Beach State School for a number of reasons. First, it provided a counterbalance to teachers' reluctance to conduct science lessons. Many of the primary school teachers lacked confidence in their ability to successfully teach science, and they expressed concerns about accessing materials and resources to meet the needs of children. Second, the Science Rally provided the environment, resources and human expertise to develop teacher competence in science pedagogy. Third, the event met a perceived need to utilise a 'hands on' approach with science. Finally, it reflected and enhanced the philosophy of multi-age grouping operating at the school. It is to this final issue that we now turn our attention.

## WHAT IS MULTI-AGE GROUPING?

Historically, children were schooled by tutors, governesses, or nannies in family groupings which included ages from early childhood to late adolescence. This type of educational organisation is known as multi-age or vertical grouping.

Division of students into classes by chronological age was introduced in the mid-nineteenth century in Massachusetts by the Prussian born Horace Mann (Anderson, 1993) and has continued to dominate the ethos of how students should be arranged for 'optimal' teaching and learning in most westernised societies. Most schools in Queensland still continue to operate under the "administrative practicality" (Anderson, 1993, p10) of grading students by their chronological age.

## WHY USE MULTI-AGE GROUPING?

There has been numerous resurgences since the end of the nineteenth century for schools to be more sensitive to differences in children's learning styles (Anderson, 1992). Many of them embrace the philosophy that the "Birth Date Effect" (Di Pasquale, Moule & Flewelling cited in Fetzer & Ponder, 1989, p193) may have negative consequences for many children. The chronological age of a child does not reflect differences in learning abilities sculptured by a kaleidoscope of variables such as: socioeconomic status, native language, race, value of education, prior knowledge, sex, physical or psychological (in)abilities, parental education level, family unit structure, access to resources at home, parental input, home environment or background.

Another rationale for repudiating organisation by age is "that a larger age span is more reflective of the child's society outside school, and that children are accustomed to associating with groups covering a wide age range" (Lodish, 1992, p21). In the following section we examine some of the perceived benefits of multi-age grouping and implications, firstly for education specifically, and secondly with reference to the Science Rally.

### What are the benefits of multi-age grouping?

Various studies (Lodish, 1992, Anderson, 1993, Fetzer & Ponder, 1989, Pittman & Hinton, 1993) have attributed specific educational benefits for both students and teachers involved in multi-age grouping. It is beyond the realm of this paper to discuss these in detail. However, it is sufficient for our purposes to enumerate these. Multi-age grouping provides:

(i)     A richer learning environment due to greater differences in group composition
(ii)    An individualised curriculum catering for student differences
(iii)   A strategy that fosters cooperation and support
(iv)    Reinforcement of knowledge and skills through peer tutoring
(v)     Formation of good relationships
(vi)    A positive attitude towards school and schooling
(vii)   A positive self-concept
(viii)  Success rather than retention with advancement paced at the individual's capacity
(ix)    Positive results for underachievers, low socioeconomic status or other marginalised children
(x)     Academic achievement
(xi)    A continuum of learning

Apart from the educational benefits of multi-age grouping, there are a number of advantages for using this form of organisational grouping when implementing an event analogous with the Science Rally. In the following section we discuss benefits as they apply to the Rally.

**What are the benefits of multi-age grouping for the Science Rally?**

There appear to be three major benefits of nongraded groups for the Science Rally. First, multi-age grouping allows for an indeed requires team teaching practices. The Science Rally relies on teachers working together in teams to guide and facilitate the experiences. Anderson (1993, p12) believes that learning encounters are "easier to produce when the philosophy and practices of nongradedness are combined with multi-age approaches and some form of team teaching".

Second, heterogeneous groups are optimal configurations for educational experiences formulated around problem-solving activities. As the Science Rally utilises problem-solving as the teaching strategy for the event, this nongraded organisational structure is a viable proposition. Finally, research (Pittman and Hinton, 1993) confirms that children appear to have high levels of acceptability of multi-age grouping even during its formative stages.

## SO WHAT IS A SCIENCE RALLY?

A Science Rally is a series of experiences organised in tabloid rotation. The organisational requirements are similar to those required to manage sport or other curriculum areas. At Palm Beach State School one day per year is set aside for this event and it involves the entire school population from Years 1-7.

Ten activities of approximately thirty minutes duration are scheduled requiring the whole school day for full implementation. Teachers nominate an activity and in pairs deliver this experience to groups of children who rotate from activity to activity over the set time. Teachers therefore have the opportunity to teach the same lesson or activity to ten different groups allowing them fine tuning of skill as well as reflection and development of confidence. Whilst experiencing the ten activities the children collect points for a variety of components. Points are awarded for cooperation, group organisation, competence, and management.

At the close of activities a general assembly is called and points are tallied for the groups. The group with the greatest accumulation of points is then awarded "The Golden Bunsen Burner" award.

## WHY HAVE A SCIENCE RALLY?

The Science Rally provides the opportunity for children to experience science and its practical applications. From our experience we have concluded that children become involved in activities when they are purposefully structured and child centred. Furthermore, the activities meed to be designed with provision for a successful outcome while being appropriate to a wide range of ages and abilities.

A well planned Science Rally can cater for these needs and can offer children worthwhile experiences that could 'turn them on' to scientific inquiry. Children involved in a Science

Rally may, in a single day of activity, cover a term's curriculum in science if ten topics are coordinated well and include activities from all of the key science areas; (i) Earth (ii) Matter (iii) Life (iv) Space (v) Energy.

Despite our enthusiasm about the Science Rally there are some readers who may suggest other teaching strategies which would equally serve the same purpose. It is our belief however, that there are many reasons to hold the Science Rally at schools. They can be summarised by three main statements:

(i)     To develop and enrich the school's science programme
(ii)    To develop and enhance teacher competence
(iii)   To promote social skills and develop school spirit

This is by no means a comprehensive list of the Science Rally's attributes, but these statements alone are justification for implementation of the programme.

## HOW CAN I ORGANISE A SCIENCE RALLY?

Organising a Science Rally initially requires certain preparation. The amount of time required will depend on the nature, structure and population of the school. At Palm Beach State School we have a population of approximately four hundred children. We are a multi-age school so we set about organising our rally utilising the school's vertical grouping philosophy. Here we will explain how Palm Beach State School organised our Science Rally.

Firstly, we obtained a commitment from staff to be involved. Then we nominated a coordinator and designed a blueprint of the science experiences that the children would encounter.

Next, the school population was divided into twenty two random groups comprising approximately twenty children of all ages from Years 1-7. This meant that the ten planned activities were duplicated (i.e. each duplicate activity was taken by a pair of teachers at a different location) and two groups would take refreshment and rest at the 'drink stop'. This resulted in half of the school population visiting one strand of activities and refreshments while the remaining half visited the duplicate strand at a different location.

The day was organised into three sessions, namely:

| | | |
|---|---|---|
| Session 1 | 9.00 am - 11.00 am |
| Session 2 | 11.30 am - 12.50 pm |
| Session 3 | 1.45 pm - 3.00 pm |

In the first session children visited four stations, the second session three stations and in the afternoon they visited another three. The rally culminated with a general assembly for results, presentations and awards. Palm Beach State School awarded points to each group for completing the activity and meeting the set criteria.

When preparing for a Science Rally it is the planning team's responsibility to determine the criteria for awarding points. Another strategy would be to allow the children to progress through the activities without creating competition.

Clearly the school's needs and resources have to be considered in organising a Science Rally. The programme implemented at Palm Beach State School is an example of a successful science event that can be easily adapted or modified. Other options include administering the event over a half day period, over several days or excluding duplicate activities. The format can be varied to meet the needs of children, teachers and the school structure.

## WHAT ARE GOOD ACTIVITIES TO CHOOSE?

In choosing activities for a Science Rally there are several considerations:

(i)     What resources (material and human) do we already have?
(ii)    What extra costs would be incurred?
(iii)   What are the needs and interests of the children?
(iv)    Have we covered a broad area from either the school programme or the 'Scope and Sequence'?
(v)     Is the activity appropriate for the age group(s)?

Many children appear to enjoy devices or substances that explode, fizz or grab their attention. A skilful science coordinator can usually give advice on these matters. It is often beneficial to establish an ongoing link with local secondary schools. They are excellent sources of information, they can provide access to materials and they may offer suggestions to improve the science event. This in turn is a good opportunity to develop a coordinated link between the children's last years of Primary School and the first year of their Secondary education. This coordinated link is known as the 'Year 6, 7, 8 Interface' and it seeks to develop a broad continuous science programme over these years to ensure basic skills, knowledge and attitudes are developed. A suitable transition for students between our two local primary schools and the secondary school (namely, Currumbin State school, Palm Beach State School and Palm Beach - Currumbin High School) has now been successfully achieved through collaboration of ideas for the Science Rally.

## CONCLUSION

Over the last five years Palm Beach State School has developed a series of activities that have been trialed and fine-tuned. The Science Rally Programme now has a three year cycle. The activities are different over the three year period and the cycle ensures that children revisit a concept a second time in their primary years. This also allows for the children in Year 7 to take on the responsibility of organising the event, overseeing the implementation, and developing leadership skill associated with facilitating the activities for their younger peers. It appears that the children do not perceive the revision of activities in the second three year cycle as repetitive or boring. Instead they revisit the activities with notably developed skills and understandings. They may remember the activity from the previous three year cycle but they approach it with different attitudes, behaviours and knowledge. They are now the leaders not the led.

Palm Beach State School's experience with the Science Rally over the last five years has shown that in multi-age groups:

(i)     Children appear to enjoy the science activities

| | |
|---|---|
| (ii) | Children demonstrate a high level of cooperation and appear to take responsibility for their own learning |
| (iii) | Children are enthusiastic about science activities |
| (iv) | Children demonstrate a positive attitude to science |
| (v) | The Science Rally develops the philosophy and goals of a multi-age school |

Furthermore, the social benefits from the Science Rally can best be described by the children's responses in an Action Research survey. There was an overwhelming response from the children that they enjoyed the day.

The teachers unanimously agreed that the day was affable. They confirmed that after implementing the event they felt more confident in their ability to successfully teach science and at the same time the experience increased their science knowledge base. They also observed significant positive changes in the way children actualised responsibility.

With support and careful planning a Science Rally will enhance a school's Science programme.


Thank you.


NB. **Submitted with this article at the Symposium:**
> 1.Pro formas and control sheets used to monitor the activities and administer the rotation. These suggestions can be modified to suit individual schools.
> 2.A selection of some of the activities carried out by Palm Beach State School has been enclosed.

NB. **Copies of these resources may be obtained from:**
> John Stir
> Faculty of Education & the Arts
> Griffith University Gold Coast Campus
> PMB 50 Gold Coast Mail Centre
> Queensland 4217
> Email: J.Stir@eda.gu.edu.au

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