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ABSTRACT

The preservice teacher education program at Monash University (Australia) focuses on the nature of learning. A central antecedent to this is to have student teachers reconsider their concept of quality learning. The purpose of this paper is twofold--first, to highlight how student teachers' understanding of quality learning develops, and how this influences their approach to teaching; and second, to report on the effectiveness and value of two approaches currently in use. The first approach involves development of a portfolio of teaching strategies, episodes, and ideas that demonstrate how preservice teachers see their role as high school teachers. The second approach places student teachers in a 10-week school-based integrated practicum and "course work" experience with the support of both professors and school supervisors. Students are placed in a position where they are able to test how the learning theory taught in their course work relates to their practice in classroom teaching. Common to both approaches is the need for the student teachers to reflect on their experiences. In both cases, the students' own experiences and the sense they make of them are the focus for their learning. Examples of portfolio items, an interview protocol, and a portfolio questionnaire are appended. Contains 13 references. (Author/LL)

Changing conceptions of quality learning in pre-service high school teachers.

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Abstract

Many student-teachers enrol in a pre-service teacher education program with the expectation that they will be told how to teach. This perception is frequently accompanied by a well-developed but transmissive view of learning (eg. Clark, 1988). Teacher education programs commonly aim to change both this expectation and this view.

The premise that underlies the pre-service teacher education program at Monash University is the need to focus on the nature of learning (eg. Gunstone et al., 1993). Student-teachers are encouraged to extend their teaching in ways that will enhance student learning. A central antecedent to this is to have student-teachers reconsider, and often change, their conceptions of learning, and, in particular, of the nature of quality learning. This paper explores two of the number of approaches currently being used to prompt student-teachers to change these conceptions.

One approach involves the use of portfolios. Student-teachers are asked to develop a portfolio of teaching strategies, episodes, ideas, etc. that demonstrates how they see their role as high school teachers. The portfolio is an open-ended and un-graded task designed to explore teaching from many different vantage points. It is organised as a dynamic assessment task, not a static end product. All student-teachers present their portfolio items to their peers and work on developing their understanding of what it means to be a science teacher through an ongoing process of teaching and learning. This process is fundamental to the success of the portfolio as a tool for learning about quality learning.

The second approach places student-teachers in a ten week school-based integrated practicum and "course work" experience with the support of their University lecturers as well as their school supervisors. Students are placed in a position where they are able to test how the learning theory taught in their course work relates to their practice in classroom teaching. Each student-teacher becomes a researcher with a focus on the nature of learning. Their task is to better understand their students' learning, and their own learning, and to reconsider their conceptions of quality learning.

This paper reports on the effectiveness and value of both of these approaches to learning to teach. It highlights how student-teachers' understanding of quality learning develops and how this influences their approach to teaching.

Introduction

The view of quality learning outlined by White (1994) underpins the two pre-service education course components described in this paper. Both approaches are used in the pre-service teacher education program at Monash University and are designed to challenge student-teachers to confront their understanding of learning.

Research on learning about teaching through the school-based experiences at Monash University has been in progress for a considerable period of time (Kushner, 1988; Northfield, in press). That research documents teacher

educators' attempts to better prepare student-teachers for their move into full-time teaching beyond a solely University course based approach. Recently, there has also been an interest in teaching portfolios as another way of helping teachers better develop and understand their professional knowledge. This paper describes some of the research derived from a school-based approach to learning to teach and the use of portfolios in pre-service education (as used by the authors) in an attempt to better prepare student-teachers for a career in teaching.

The pre-service course at Monash University is a one year Graduate Diploma in Education (Dip.Ed.) taken by students who have completed a first Degree (eg. Bachelor of Science, Bachelor of Economics, Bachelor of Arts). The data described in this paper are derived from student-teachers' interviews, questionnaires and journals.

Portfolios

In 1993 there were thirty prospective science teachers (physics, chemistry, biology and general science) enrolled in the pre-service program known as Stream 3. The Stream 3 course (Gunstone & Northfield, 1992; Gunstone et al., 1993) focuses on learning from two perspectives, that of a student experiencing aspects of learning about science concepts, and that of a teacher learning how to teach the concepts. To do this, the program endeavours to model teaching strategies in context for student-teachers. The reasoning underpinning this approach is that participants will better recognise the value of different teaching strategies (or procedures) if they experience them as genuine learners, rather than being told about them. Other aspects of the program include a techniques course whereby participants sign-up for classes in both content and pedagogy in science subjects with which they are unfamiliar (eg. physics for non-physicists, biology for non-biologists). Stream 3 students also meet weekly in tutorial groups and throughout the year move through a semi-structured program designed to expand their understanding of teaching and learning science.

The Stream 3 program endeavours to place student-teachers in situations where their understanding of science content, and therefore their approach to science teaching, is challenged so that the link between teaching and learning is explicit. It is intended that this approach to learning about learning and learning about teaching will influence their own teaching practice and carry on through their teaching careers. While all of this is unfolding, the student-teachers are also involved in developing their teaching portfolios. These are designed to help them reflect on their understanding of what it means to be a science teacher so that they are able to communicate and articulate this (in varying ways) to others.

As Bird (1990) points out, the notion of a portfolio is an idea borrowed from other professions (eg. architecture, photography, art) and as such brings with it connotations of its use from those fields. It is therefore important that a *teaching* portfolio is not simply viewed as an end product, a receptacle that contains snapshots of a teacher teaching, or well polished, carefully chosen examples of work; it must also be seen in light of the experiences, thoughts, actions and subsequent learning that are the precursors to the formation of the items contained in the portfolio.

Portfolio development in pre-service education courses has been seen as a way of encouraging student-teachers to document and describe their skills and competence as a teacher for future employment possibilities (Robinson,

1987; Weinberger & Didham, 1987). However, portfolios should not be viewed as an "exercise in amassing paper" (Olson, 1988). The portfolio should:

> give a student an opportunity to take responsibility for his/her learning. Although a teacher may set broad parameters for the portfolio, it is the student who decides what to include and, more importantly, what the contents mean. Making these decisions requires introspection and encourages the student to focus more clearly and directly on his/her learning. (Garman & Piantanida 1991, p.2)

To help student-teachers approach their portfolios in this way, the Stream 3 course views the portfolio as being both a process and a product. The process, as it evolves in the Stream 3 tutorial groups, draws on a variety of activities, teaching and learning experiences, and presentations that the student-teachers are involved in during the year. The products are the documents that student-teachers produce to represent their understanding of these experiences. A major focus of both the process and the product is to help student-teachers begin to articulate their understanding of what they think it means to be a science teacher.

The portfolio as a process

The portfolio as a process hinges on student-teachers thinking about their teaching and learning. Accessing this thinking may be through such things as tutorial group presentations, re-examining their teaching round experiences, or experimenting with different teaching strategies using their peers as learners. In any case, reflecting on these experiences is important so that student-teachers have an opportunity to reconsider their point of view and to see situations in new or different ways.

Tutorials sessions offer student-teachers a safe, trusting non-judgemental environment in which to explore their views and to reflect on their teaching and learning. The following vignettes have been constructed from episodes in tutorials and are designed to illustrate the type of learning that comprises the aspect of the portfolio we consider to be process oriented.

Case 1: The use of models in biology.

Marsha had constructed a model of the phases of mitosis in her biology teaching method class and was keen to share her experience with the tutorial group. She happily volunteered to use her model to teach the group about mitosis.

In her introduction to the class Marsha spoke about the value of using a model in teaching as an alternative to using diagrams in a text book: it is a more realistic representation of the article under consideration; there are advantages associated with the use of a three dimensional rather than two dimensional object.

Throughout her presentation she used the model to demonstrate and explain the stages of mitosis, carefully pointing out the distinguishing features and changes associated with each stage.

Marsha answered a number of questions during the presentation and often referring to the model to emphasise the point she was making. However, at the end of the presentation she was confronted by a puzzling situation.

Although she had painstakingly explained the process of cellular reproduction, she was unable to understand why some of her peers were confused about chromosome replication. Through the ensuing discussion she struggled to re-explain the steps of mitotic division, then with a smile she said, "Wait on, I know the problem. Making the model taught me about division not replication. Replication occurs during late interphase, the rest of the stages are how the cell divides. Making the model was the important thing in learning about division, if we made models for replication we'd understand that better too."

Marsha had realised that although the model was a good tool for explanation, constructing the model was a better tool for learning. As she reflected on how she learnt through creating her model she began to recognise the value of using concrete tools for learning. Her view of the purpose of models had changed dramatically as her focus shifted from a teacher centred approach to a learner centred approach. She better understood the difference between learning through doing as opposed to listening to the transmission of information.

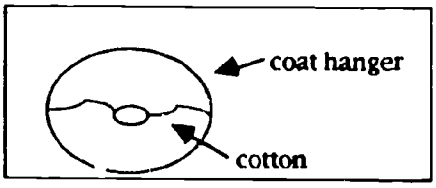
This realisation had occurred because Marsha was challenged to reconsider what she had (perhaps) taken for granted or not been aware of in her initial exploration of modelling. Her understanding of the use of models had been enhanced.

Case 2: Surface tension

Anna was a physicist whose curiosity was aroused by an everyday washing up phenomenon. She wondered why the surface tension of water changed when dishwashing liquid was added to it. As a bright, highly motivated student-teacher, she researched the topic in her quest for an answer. Having done so she wanted to share her findings with the rest of the tutorial group and suggested that 20 - 30 minutes would be ample time.

She started the session by adding some dishwashing liquid to a bucket of water. Then she bent a wire coat hanger into a circle approximately 20 centimetres in diameter. Next she produced a piece of cotton from which she created another circle and loosely attached it to the coat hanger, as illustrated in Figure 1.

Figure 1: Coat hanger and cotton loop used in the water and dishwashing liquid bath.



Anna then turned to the class and said, "I'm going to dip this [coat hanger] into the bucket, what do you think will happen?"

A range of answers was suggested and Anna quickly listed them on the chalkboard. She then dipped the coat hanger into the bucket then held it up for the class to see. A thin film covered the coat hanger and the cotton appeared as a line loosely bisecting the wire circle. Without saying

anything, she took a knife from her bag, dipped it into the bucket then poked it through the film. To her onlookers' surprise the knife passed through, without breaking the film. She pushed the knife back and forth a number of times but the film remained unbroken. She put the knife down then picked up a cloth and gently poked at the centre of the cotton. The small cotton circle which had initially been closed, sprang open up as the film around it attempted to contract towards the edge of the wire. There in the middle of the film was a perfect circle.

Anna turned to her audience and asked them to explain what they had just observed.

Forty-five minutes after she had started the session, Anna turned to the chalkboard to give a theoretical explanation of surface tension. Ninety minutes after she had started the session she thanked the class for their participation and packed up her equipment. Everyone was surprised at how long they were engaged in the exercise, none moreso than Anna.

Someone asked her where she got the idea. Anna explained that she thought she would try to teach the concept of surface tension in the way that she had learned to make sense of it herself. She also said that her understanding had further increased as a result of the session, some of the questions she had posed during the session were ones which genuinely puzzled her at the time. The interaction had been a learning experience for the teacher as well as the students.

Because Anna was prepared to take the risk of approaching her lesson by presenting a puzzling situation for all to explore instead of introducing the theory first, everyone had the chance to challenge their own understanding of surface tension. Learning about learning from a learner's perspective was a valuable experience.

These vignettes are presented to illustrate some of the processes that are the precursors to portfolio item production. The next task for Marsha and Anna was to somehow construct a portfolio item that might convey to somebody else what they had learnt from the experience and how it influenced their view of being a science teacher. Although Marsha and Anna were the teachers in these instances, each of the student-teacher participants could also reflect on these experiences to produce portfolio items. The process involves learning about teaching, as well as learning about learning.

The portfolio as a product

As stated earlier, the portfolio items were designed to help the student-teachers begin to articulate their understanding of what it means to be a science teacher. Consequently, there could not be a 'right' formula for the formation of an item as they would inevitably reflect differences in such things as philosophy about science teaching, teaching and learning experiences, creativity, product layout and design.

Portfolio items are meant to convey to others an individual's understanding of their view of teaching and learning science. They cover a range of experiences including teaching strategies (how they have been and might be used, when they might be appropriate), views on student learning and how they might influence teaching, conducting field trips, assessment strategies and extra-curricular activities, to name just a few.

We encourage the student-teachers to develop their portfolios with employment opportunities in mind. Therefore, each item needs to convey its message in a simple and meaningful way. We argue that if the items meet this aim, that the student-teachers would be in a better position to illustrate (for a prospective principal) what they had to offer a school. This means that a job interview might be more likely to focus on the specific teaching and learning approaches the student-teacher advocated and used, by giving them active input in the direction of the interview through access to the portfolio. In essence, they would be able to use their portfolio to creatively demonstrate how their views of teaching and learning were shaped and how these influence their teaching practice.

One important aspect of portfolio items of this nature is that in many cases they would not be able to 'stand alone' to fully convey their meaning. They are more meaningful and useful if their creator is present to answer questions arising from viewing them so that the intricacies of their meaning might be explained, therefore enhancing the message they are attempting to communicate. They are designed as a prompt to delve into the student-teacher's understanding. They are not an attempt to simplify or summarise the complex, inter-related thoughts and actions associated with teaching and learning, rather they are a way of initiating dialogue about the problematic situations in teaching and learning from their creator's perspective.

Finally, we anticipated that the creation of portfolio items would be influenced not only by the process aspects of the tutorial sessions, but also by reflection on the product and how it conveyed its meaning and caught the observer's attention. Therefore, we encouraged the student-teachers to display and discuss drafts of their products so that they could better refine them before they compiled their final portfolio. Appendix 1 contains a small cross-section of some of the 1993 participants' final portfolio items.

Research method

The research reported in this section of the paper explores 1993 student-teachers' understanding of portfolios. The data is derived from two sources: (i) interviews from a sub-set of Stream 3 students (n=8) who volunteered to be interviewed during the year, and (ii) an open-ended questionnaire completed at the end of the course by 22 of the total 1993 Stream 3 cohort of 30.

Interviews were conducted on two separate occasions. The first was mid-way through the course, prior to their second teaching round, and the second was close to the end of the course, after their third and final teaching round. Interviews were conducted by a research assistant who worked through a semi-structured interview protocol (Appendix 2) designed to determine the student-teachers' understanding of the Stream 3 course, its assessment procedures and the participants' views of the portfolio task. The use of a research assistant was seen as one way of diminishing the likelihood that participants would feel obliged to tell us what they thought we (as their teachers) might want to hear.

The questionnaire (Appendix 3) was administered at the end of the course after the participants had received their final assessments. This was an attempt to gain a broader understanding of the Stream 3 students' views of portfolios and the value they placed on the experience.

Findings

The portfolio, like any open-ended task, encourages a diversity of possibilities and, as is the nature of a task where creativity and imagination are major shaping factors, initial problems with task definition are to be expected. However, we were surprised with the difficulties some student-teachers had in coming to an understanding of what they were being asked to do in creating a teaching portfolio.

Many of the interviewees initially thought the portfolio task was simply a matter of collecting resources then "bundling them together". Over time this view was modified as the beginnings of an understanding of reflection on learning began to influence individuals' thinking of the portfolio process, "Its helped me organise my learnings from Stream 3 and [teaching discipline] methods under one umbrella."

It was not until the student-teachers linked the notion of presenting *their* views on *their* learning to a prospective employer that a better understanding of the task began to emerge.

The focus of the portfolio is for the student-teachers to develop their own philosophy of what it means to be a science teacher. To do this they have to explicitly link a variety of ideas from their experiences and make judgments about these ideas by thinking about and questioning their own learning; being metacognitive. Although this may appear obvious, for many of the student-teachers this was not so until they thought about an intended audience (prospective employer). Focussing on an audience for presentation helped to clarify the task. However, importantly and for us, it did not lead to more convergent outcomes.

Throughout the interviews it was increasingly apparent that there was a gap between the student-teachers' thinking and doing in terms of portfolio production. If an individual had not attempted to produce a portfolio item then there was a sense of confusion about what to produce. The portfolio process was seen as separate from the portfolio product because the explicit link in thinking about the teaching and learning had not been made. Until a situation arose where it was necessary to reflect on one's experience (by producing an item) the notion of a portfolio was an abstract concept. Once work on a product was initiated a better understanding the portfolio developed.

> Irene: It [portfolio] is intended as a means of reflection for me throughout the year.
>
> Ellie: It is so I look at the things done in science...and pick out various incidents and put them in the portfolio under some sort of title and say what I have learnt from it, indicate what I have done and what I have achieved, what I learnt from it and what it meant to me, and how it will impact on my teaching in the future.
>
> Bruce: If you have a reason for doing something you can actually point it at that reason. If you have no reason to do it, it just becomes an onerous piece of work with no meaning...now that I understand the task, there is a point and it is worthwhile.
>
> Valerie: It [portfolio task] could have been explained better to begin with. I did something similar with a year 8 class on teaching

> rounds and can [now] see, looking back, the problems that emerge with an open ended task. I can link it to the problems I had.

Rather than being a static product, the portfolio task is quite dynamic as it relies on the student-teachers reflecting on such things as the episodes, experiences, and images that colour and define their picture of their philosophy of science teaching.

Similarly, learning from and with others through the tutorial sessions was important if student-teachers were to link the notion of the 'process and the product' approach to portfolios. For the student-teachers to explore what they think and what they have learnt, they need opportunities to formulate their views and try them out with others. To foster this, the processes of the tutorial sessions were seen as a way of helping them to modify, adapt and adjust their ideas through and after sharing them with others.

> Stan:...[tutorial sessions are meant to] probably build up confidence and self esteem, just being able to get up and have a go, even if you're not quite sure...and then start working through it and ask questions of the class to see if they're understanding it, it is more interactive. You're being taught ways of doing things. You can't assess ways of doing things by saying, "write down how it can be done," instead they're [the lecturers] saying "do it"...that's a much better way...
>
> Ellie: ...in tute's [tutorial sessions] you are more likely to remember the point being made or to think up your own ideas about things. You can think about some point and just then bring up or discuss it further or whatever.
>
> Irene: ...they [tutorial sessions] make you think. If teachers just tell you something, it doesn't make you think...strategies used in Stream 3 are meant to help me as a learner as well as a teacher. The point of the tute's [tutorial sessions] is to share experiences and learn from them.

It is likely then that a good understanding of the portfolio task would not evolve if participants were not given opportunities to reflect on what they have done and learnt from their experiences. We viewed tutorial sessions as a structure that was fundamental to encouraging this to occur. The questionnaire results support this proposition.

Student-teachers' perceptions of the portfolio task (question 3 on the questionnaire, see Appendix 3) show that 20% of the respondents saw the task as useful and took the task seriously from the outset ("My aim with the portfolio was to produce something of a standard suitable to be used in a job interview - I took it very seriously") while 50% were confused as to what the task actually was and so struggled in their approach until they better understood what was intended. When they better understood the task they then approached it with more enthusiasm and hence took it more seriously. "I did take the task seriously, but my approach was very linked to my understanding of the task and I [initially] had very little of that."

There was an overwhelming view that the portfolio task was seen as a valuable process by the student-teachers, (question 4, see Appendix 3) although (again) some mentioned that it was not until they produced items that they fully understood the portfolio and then learnt from the task. Only two students did not see the process as valuable. The majority commented on

the usefulness of the portfolio task as a means of "reflection on the course", "views on teaching", "things learnt during the year", and "goals for the future."

> ...making up a portfolio requires a lot of thought; about yourself and the direction you are heading in.

Most student-teachers viewed tutorial sessions as a means of broadening their ideas about, and strategies for, teaching and learning in science (question 5, see Appendix 3). These were also seen as good for discussing ideas proposed in lectures, sharing of ideas in teaching, portfolio presentations and "organisation of communal projects such as camp, portfolio, techniques, primary school visit etc." This point is particularly interesting as the portfolio is seen as a communal/shared activity, suggesting a perception that the learning processes do extend to all members of the group, not just the individual who might be presenting a given session.

Importantly, two respondents also commented on attendance in tutorials and how this affected the learning outcomes for the group. It was suggested that a diminished audience for a portfolio presentation influenced not only the learning for the student-teacher presenting, but also for the other participants because a smaller group meant either less interaction or that interaction was less intense/sustained in a smaller group ($n < 8$).

As stated earlier, once participants started to construct their portfolio items, their understanding of the task increased. All of the interviewees saw their portfolio as a good resource for displaying their skills and knowledge to potential employers but they also saw product development in terms of their own professional development. They commonly stated that the portfolio was a means of "reflecting on what had been done and learnt."

By working on their portfolio with both of these aspects in mind the student-teachers are encouraged to think about their own thinking. As they create items there is a need to think about the meaning of items individually as well as how the items combined (in the portfolio) contribute to an overall picture of that person's approach to, and thinking about, teaching and learning in science.

> Rick: I guess it's (portfolio) so others can see that we've known what we've been doing...it makes you think about what you did and reasons why...bringing things back into our mind again.
>
> Ellie: ...doing the portfolio is like doing an essay without doing any work...get the thoughts down in order and you don't have to worry about actually writing an essay to do that. It's like a point form essay on your idea about teaching and learning...it's getting all the thoughts in a proper order, that's easier in a portfolio.

Ellie alludes to the idea that the portfolio is a product which is well organised yet structured so that it can be responsive to the changing/developing views of the individual. The questionnaire data also supports this proposition. Responses to the question, "How did you go about organising your teaching portfolio?" were related to when student-teachers started to construct their items. Those who started early in the year collated material and then selected that which was important to them and tried to put these items/ideas in an order and format which made sense to them and was visually stimulating. This final step led to a divergence of finished products as individuality and

creativity came into play. One student-teacher organised his portfolio around three key questions: Who am I?, Why do I want to teach science?, and How do I teach science? Others organised their material systematically as an event occurred during the year whilst one student-teacher organised the material in order of importance, and another in order of visual impact.

The organisation of the portfolio was influenced by the items included. Developing finished products led to a greater understanding of the value and use of a portfolio. Not surprisingly then, student-teachers included in their portfolio aspects which they believed to be relevant to themselves as teachers and learners which they could expand upon in an interview.

The questionnaire probed perceptions of what the final portfolio represented. Responses include:

> The portfolio is made up of things I've done, things I've seen and things I think I'd like to try.
>
> It's a good way of showing [a prospective employer] what you know/understand.
>
> It's an insight into me as a person and as a teacher.
>
> It shows that I am still developing skills and gaining knowledge that will benefit my career.
>
> Because my view of teaching is that people learn in many different ways, content must be presented and investigated in many different ways, my portfolio tries to show that.

Student-teachers saw the role of the portfolio primarily as a tool to take to an interview to promote themselves and to give some means of control or direction in an interview. But a secondary role was also recognised, that of showing what they had learnt about teaching and learning in science. They saw the portfolio task as a reflection of the course, how they felt during the year, what strategies they had used, and as a reference point for the future to remind them of what they had thought and learnt during the year.

A major test of the portfolio is then in its use during an interview. Unfortunately, very few student-teachers had actually had an interview at the time they were completing the questionnaire, but most wrote that they would use the portfolio if they were interviewed for a teaching position. Of the three who had been interviewed, one had not used the portfolio, "because the nature of the interview was not particularly standard so it didn't really come up." The other two had used their portfolios in an interview, and one of these mentioned that she had also used the portfolio to prepare for the interview.

Finally, most respondents could see a use for their portfolio in the future. A number mentioned that they would continue to develop and add to their portfolio. Some noted that it would not only be useful for interviews, but also for looking back on when teaching. At present job prospects in Victoria are not good with perhaps only 30% of student-teachers gaining full-time employment as the Government is implementing cut-backs in the Education budget. Because of this, many student-teachers saw the portfolio as something extra to give them an advantage in an interview. A number believed that this fact should be stressed to future Stream 3 students to give them an edge over their competitors in search of a teaching appointment.

Overview

The major thrust of the portfolios in the Stream 3 program was as a way of enhancing student-teachers' thinking about their own teaching and learning, encouraging them to take more responsibility for their thoughts and actions. For this to occur, the student-teachers needed to develop their own understanding of what it means to be an independent or responsible learner, and to consider how that might influence their own practice.

A range of views on what it means to be an independent learner were suggested during the interviews.

> Irene: you do not expect the teacher to do everything for you, to think for you, tell you what to learn, tell you what to pay attention to...I think it is students [who] start to think about wanting to know more, want to know other things.
>
> Stan: Presenting the learner with something and getting them interested in it so it's not you [the teacher] making them learn, it's them wanting to learn. Once they start wanting to learn they start asking questions and the drive for learning is coming from them and not from you.
>
> Ellie: A critical approach to the information which is offered to you.

An interesting aspect to this notion of learning is that while participants stated that the teaching strategies they were being exposed to in Stream 3 were designed to foster independent learning, they found it difficult to articulate how this knowledge influenced their own practice.

A good example of this is in the way that many interviewees thought that independent learners start to question what they are doing and make links between different experiences and pieces of information. However, they indicated that they initially found this difficult to do with the portfolio. Until they started to construct an end product, the (apparently) abstract nature of the product task made it difficult for them to apply such strategies and to link other learning experiences to the portfolio task.

This encapsulates what we see as the paradox of portfolio production. It is difficult for an individual to imagine what to produce until they review their own learning and experiment with ways of conveying that to others. The process side of the portfolio attempts to foster independent learning but the student-teachers do not appear to identify that until they embark on constructing an end-product. There is a critical difference between a portfolio item that reflects one's achievements and an item which is an insight into one's thinking. For the *first* portfolio item, recognising and understanding this (for these student-teachers) seems to occur at the time of creating that item, not at the time of thinking about what to produce.

Through the portfolio task, we are asking student-teachers to undertake some learning, reflect on it and make it meaningful to themselves, and at the same time to consider how to convey this to others. To do this, the portfolio encompasses learning about one's own learning and teaching, and understanding how that might influence their approach to the students they will teach. Many pre-service teachers have no script (White, 1988) for this

as they have not been required to consciously reflect on their own learning in this way before.

Their traditional notions of "work" and "learning" were being challenged. They were having to think and reflect on the portfolio's purpose to help them make sense of what the work was that they were really required to do. Work was not only the performance of a task, creating a piece of work or a model, it was also reflecting on an experience and determining what had been learnt from that experience. An interviewee with an engineering background articulates this point well:

> the work gets in the way of the thinking [in engineering], I had not thought about it until now, but I remember something one of the lecturers said, I think it went the work is often busy work, just keeping you occupied. The real work is the thinking that you have to do. Too often the busy work is what is valued and the thinking is often forgotten.

The Stream 3 staff now need to find ways of introducing and developing the portfolio which makes more explicit the dilemma of better integrating the process and product approach to portfolios for the student-teachers. The student-teachers need to be more aware of what it is that they need to come to grips with as they attempt to use their portfolio to communicate their evolving understanding of what it means to be a science teacher.

School-based program

The normal practicum for student-teachers enrolled in the Diploma in Education at Monash University consists of three blocks of experience, usually in different schools. The first two blocks are of three weeks duration and the third is for four weeks. In the school-based program the second practicum block is replaced with an extended ten week school-based experience designed to focus on student-teachers' learning from "a school, rather than classroom, perspective" (Northfield, in press).

The school-based experience is an alternative program within the Dip. Ed. course. Because it requires a staff and student-teacher commitment beyond the norm it is comprised solely of volunteers. The student-teachers become full-time staff members in a school for a 10 week term and their teacher educators (Northfield & Brown) also spend a considerable amount of extra time supervising, teaching and de-briefing their student-teachers on site at the school.

The school-based program arose out of perceived needs to develop a more valid teaching experience for student-teachers than was possible in a 3 - 4 week teaching block, and to find genuinely realistic contexts for student-teachers to learn about teaching and learning. The purpose of the extended school experience is to do more than act as a form of socialisation, it aims to challenge the participants to be involved in a continuous learning experience (Northfield, in press). To do this, student-teachers must become part of the school, rather than short-term visitors. Also, the teacher educator needs to be able to support the student-teachers' learning through adapting their usual course approaches to the context of the school. This involves changed and more demanding teaching roles for the Monash staff.

In 1993 19 school-based student-teachers undertook the extended placement, each being allocated to one of four participating Secondary Schools. The following data is from student-teachers' journals and the field notes of their

teacher educators. It is designed to illustrate the learning that occurs through the nature of the extended school-based experience.

Teaching and learning: developing an understanding

Some student-teachers join the school-based program because they think that it offers them an opportunity to gain more teaching experience, and that through that experience they will become better teachers. However, experience alone is not sufficient for learning. The school-based program, as with the "normal" Monash program, attempts to challenge the participants' views of teaching and learning so that they learn through reflection on experience. However, the school-based group is particularly characterised by the close intertwining of student-teachers' experience, Monash teachers' reactions and thoughts, and the relative immediacy of the reflection.

In a tutorial session, one of the school-based student-teachers described the school-based program in the following way:

> I like the practical side of the Dip. Ed course - that is that the students are able to participate in the learning process actively and are not just told everything but are actually given the opportunity to participate wholeheartedly.

One of the 1993 student-teachers had some experience as a tea... in a Saturday Greek School organised by her local church. Her experience in the school-based program demonstrates the rethinking that can occur when the perceived role of teaching is reconsidered.

At the start of the year Adriana described her understanding of teaching from the perspective of her Saturday morning class experiences. Her view of teaching was drawn from that perspective.

> the teachers are rather conservative and hold on to the firm belief that dictatorship is a good thing...they are strict and severe...[students] memorise twenty pages or more: history, geography..

Adriana found that coming to grips with the difference between the learning style she experienced as a student through the school-based program, and that of her teaching in the Saturday Greek School, created a dilemma in her practice. She found it difficult to "let go" of the teaching style with which she was most familiar and struggled to accept responsibility for her own learning.

> this freedom [in the school-based program] is more stressful to me than being told or ordered what to do.

Adriana had problems on her first ("normal") teaching round. She tried to teach in a style similar to that which she had experienced in her Dip Ed classes, whilst still expecting to control/direct her students in the same manner as she did in the Saturday Greek school. She had not reasoned through the implications or expectations associated with teaching strategies that were based on students accepting more responsibility for their own learning.

The difficulties created by the conflict of outcomes were exacerbated when she was visited by one of her Teaching Method lecturers from University.

Her confidence was shattered when she was quite bluntly told that her teaching was not satisfactory. The rather 'strict and severe' approach was quite hurtful and Adriana found it difficult to cope, or to know how to respond. The direct approach used on her was not dissimilar to that which was practised in the Saturday morning classes. However, now as a recipient of that approach she viewed it from a student's perspective and it was painful.

> I was in tears most of the first week. When my Teaching Method tutor came she criticised everything...I felt terrible and I had low self esteem.

Adriana had difficulty separating criticism of her teaching from personal criticism and as a result retreated into a more transmissive mode of teaching. In the normal course of events, this retreat would have been sufficient for her to 'survive' the teaching round but it would have made it difficult for her to take the risk and try something new or different again. The advantage of being a school-based student-teacher on her subsequent teaching experience, although Adriana may not have seen it that way at the time, was that the extended practicum offered her opportunities to revisit the experience rather than to remain sheltered in a didactic, static, safe approach to teaching. As she slowly regained her confidence and examined her teaching more closely, she was able to (eventually) learn from the experience and apply it to her own practice.

During the school-based experience Adriana worked hard to overcome her problems as she continued to reflect on her experience. After a number of discussions about the difficulties she had encountered on her first teaching round, she wrote in her journal:

> what I have learnt now is that having a few bad lessons does not necessarily mean that I am a terrible teacher. I am human and I do make mistakes! The criticisms made of you, you should not take to heart. Instead of thinking that the criticisms mean I am "bad", I am beginning to think that they indicate areas I can improve.

Reflecting on her experience in this way was empowering. She was then able to apply the lessons from her learning to her approach to the students she was teaching. The effect of the feelings of failure on her self esteem and on her ability to perform in the classroom were translated into action in her own practice. She had made a link between her learning and her teaching which she had previously not recognised.

> I [have] learnt to criticise constructively and positively. I became conscious of how I marked work. When I criticised I came up with at least two positive comments about a student's work...
>
> When I marked their assignments, besides grading, I included constructive comments. I refused to write comments that would humiliate or embarrass the student. I commented on their effort and what they did well. Whenever I came across work that needed improvement I wrote in a diplomatic way so the student would not feel insulted or feel terrible.

Through the school-based experience she was encouraged (and able) to re-assess her own experiences, learn from them, and apply that learning to her own practice. The unsettling episode from her first teaching round was confronted through her extended practicum as she was continually

encouraged to think about her teaching and learning, something which she may well have managed to avoid in a three week teaching round. Over time, she was able to capitalise on the experience and use it to positively influence her teaching and her students' learning.

In her final ("normal") teaching round she developed a creative writing unit which encouraged her students to experiment with different forms of writing (personal, informative, descriptive and dialogue). The final component of the unit required groups of students to create a dialogue and perform it for the rest of the class. This teaching approach was far removed from the transmissive nature of her teaching at the beginning of the year. Through the school-based experience she had reconsidered her view of learning and teaching and had started to better link them through her practice.

The school-based experience gave Adriana an opportunity to reconsider her approach to teaching in a slow a cautious manner without feeling the need to "prove herself" immediately. These positive outcomes for Adriana (and her students) we believe, would have been far less likely if she had been involved in shorter teaching rounds.

Building trust in a relationship

Adriana's success in learning about teaching and learning was enhanced through the relationships built up between herself and her school supervisor, her school-based university teachers, and her peers.

As she struggled to face up to the problems she was facing in her teaching, she was supported by her supervisor's and colleagues. The care and concern that they demonstrated through their support helped her to slowly rebuild her confidence and to take the steps to move forward in her teaching.

Her supervisors took an active interest in her development such that although they were still ultimately responsible for her assessment, this was not a barrier to building a relationship. In this case assessment was more to do with learning than judging.

Perhaps this recognition also influenced the way that Adriana worked to build a meaningful relationship with her students. In one case in particular, she worked with a student in her class in a way which was similar to the way her supervisors had worked with her. She spent time negotiating a special task with the student, recognised the importance of dialogue and expected him to achieve if she provided positive reinforcement for those behaviours which she saw as appropriate.

> Shane did not want to participate at all. He was excluded by the other groups and ignored. He was hostile and I could not coax him to join the groups. After a lot of deliberation I asked him whether he would like to videotape the groups performing. He agreed. While the other groups worked he wrote down how he would film it and what was important in filming. Afterwards he needed to discuss the difficulties he faced and what he liked and disliked.

Adriana had benefited from her membership of the school based group in a number of ways. The special relationship developed within the group provided her with much needed support during her initial difficulties. The length of the school-based experience meant that she had to work with her school supervising teachers over an extended period of time. They planned a

range of different teaching activities for her (eg. working with small groups, being responsible for a small segment of the lesson) to enable her to gain confidence in the classroom. These options would have been less likely if she had been in the school for a three week teaching round. The frequent contact with her university teachers during the extended round reinforced the value of self esteem in her ability to learn, therefore the nature of the learning process had been enhanced.

One other important relationship in the school-based experience encouraged by the university teachers is the collegiate relationship amongst the group within the school. The Monash teachers are responsible for organising and creating situations so that the student-teachers at the school become cohesive and supportive of one another. Through a process of regular meetings, lesson debriefings and teaching sessions, the university teachers aim to have the student-teachers working together as colleagues so that they all share one another's experiences. It is anticipated that they will not be viewed as individual student-teachers visiting the same school site but as a group who are working and learning together, with and from one another, as they learn to understand the complexities of the school context by being a part of it.

The development of the team approach with the student-teachers offered Adriana support from a colleague who was finding the experience in the same school quite different. Whilst Adriana was having problems Sally's attitude was much more buoyant. She wrote:

> I love teaching the Year 7 and 8's...I have so many ideas I want to employ

Sally was the student-teacher who was commonly described as a born teacher. She took most things in her stride and could have easily coasted along. Through the group meetings, an understanding that each of the student-teachers was continually being encouraged and challenged regardless of their perceived strengths and weaknesses is important. In Sally's journal her University teacher wrote:

> You will (also) need to set yourself some challenges in your teaching - this may be in terms of sorting out how you work out if the students have learnt anything in your lessons: how to match a strategy most effectively to what you want to achieve in your lessons, ie. there are many ways of teaching this concept - what will work best, not just, what will work.

Through the group meetings, an understanding of the importance of knowing the individual and setting appropriate goals for learning is modelled and practiced. As the school-based group reflected on their experiences both individually and collectively, their recognition of individual differences and the importance of catering for these, influenced their learning.

This team work was recognised and appreciated by the student-teachers as they worked together in their schools:

> the team support is essential for the bouncing of ideas, rough classes, problem students, problem supervisors, team teaching, observations...all round helping hands. They are especially useful when you need to cut and paste, photocopy, or colour in things for a class that is only minutes away.

Support at the personal and professional level is one of the key features of the school-based group. For Adriana the support from the university teachers, the school teaching supervisors, and, importantly, a fellow member of the school-based group fostered relationships that helped her to face the challenges placed before her. For Sally, even though her situation was different, the same support was equally important in fostering her development. She, like Adriana, was helped to progress and reconsider her teaching rather than to maintain the status quo.

Supervisory planning

Learning from the school-based experience is not limited to the time spent in the school. After the extended practicum the student-teachers come together again for the remainder of the University based Dip.Ed. course. An important aspect of this re-joining the course is that their university teachers (Northfield & Brown) team teach all these student-teachers' subsequent program (except for subject specific teaching methods).

To further capitalise on the student-teachers' school-based experiences, they jointly planned tutorial sessions, conferring about the most appropriate strategies to use to highlight the issues which they wish to raise. Through this joint planning they recognised an issue that they saw as important to be addressed. They felt that there was a need to broaden the student-teachers' range of teaching strategies and to link these to the learning theories which underpinned each.

They discussed ways in which they could introduce different teaching strategies: through the use of content from a particular discipline (eg. physics, maths, history); or related to particular sections of the course; or by curriculum issues such as assessment, and team taught the sessions. However, the real strength of this approach is drawn from the detailed knowledge of the individual student-teachers' development during their school-based practicum. Because they had first hand and extensive knowledge of the different challenges each student-teacher faced, they were able to organise their teaching to tap into those issues. Therefore they further facilitated reflection on experience in the context of the original experience. The university teachers' intimate knowledge of the student-teachers' school-based experiences became a catalyst for facilitating relevant and worthwhile teaching and learning episodes.

A good example of this point was through the knowledge of one student-teacher's (Tom) understanding of the use of role plays. Because Tom had used role plays during his school-based practicum, and because knowledge of his understanding was readily accessible and apparent to his teachers, they were able to apply tap into that knowledge to benefit the rest of the group. Tom had written in his journal:

> I like to use role plays in my classes because the students find the notion of taking on a character a much 'safer' way to make mistakes. The result is as they make mistakes they are able to have a more valuable piece of learning. I've also found that the kids enjoy it, which means their motivation levels are high and they are willing to learn.

Tom "unpacks" the use of role plays in his language classes from two perspectives: learning and motivation. He has taken the risk of using teaching strategies which can lead to management problems, but

importantly he is more concerned with the learning that is occurring than with the potential management issues. He demonstrates a concern for the longer term development of his students. Who better to lead a session on role playing and its value for learning than Tom?

The main focus of seminar discussions after the school-based experience was to continually challenge the student-teachers to reflect on their experiences. Through their extended practicum they had a broad range of school experiences which provided ample fuel for thought. By encouraging the student-teachers to reconsider their experiences the sessions act as "a means by which the knower appreciates, or apprehends practice situations" (Grimmett, 1988, p.12) through which they are given opportunities to assign new significance to that experience. The following statement by one of the student-teachers during a session on classroom management illustrates this point:

> I've been thinking about this, and I think a lot of what we call management problems are really learning problems

Because the university teachers planned and taught their sessions together, they were able to bring their knowledge of the student-teachers and their special needs to bear on the teaching and learning episodes they created throughout the program. They continually fostered and used reflection on practice.

Being a part of the school, not a visitor

An important aspect of the school-based program is the need for the student-teachers to become fully integrated into the school's activities. They need to become a real part of the school, a full-time staff member. This integration is important from two perspectives: the school's and the student-teacher's.

One way of illustrating the extent of this integration is from an activity on the final day of the school-based experience. All of the student-teachers met early in the morning for a tour designed to enable them to see the four schools in which their peers had been working. Each group of student-teachers was asked to organise a program of about 45 minutes for the visitors to their school.

In his journal, one student-teacher (John) wrote:

> If I had to find a high point for my Dip. Ed year it would have been this day.

John had organised a Courtroom in the staff recreation area of his school. He and the other student-teachers were to be put on trial for their actions whilst at the school. The collegiate relationship they had established with their supervising teachers during the extended practicum enabled them to call teachers and students as witnesses for the prosecution and defence. Each witness provided evidence which included (often humorous) data on the way each student-teacher had become involved, both inside and outside the classroom.

> This day for me highlighted all of the energy that needs to be present outside the classroom, that can then be directed into the classroom and the job of teaching. The qualities present on this day when a large number of staff came together to complete a joint task and enjoy themselves, of co-operation, humour, goodwill and

> creativeness were all present in abundance. [I had] A sense of belonging and rightness that has yet to be repeated.

It was immediately evident that these student-teachers had an entirely different relationship with their supervisors, other members of staff, and students from that which is apparent during a three week practicum. The sense of belonging which had developed bore little resemblance to that descr ed by one of the student-teachers during the first teaching round.

> The other student-teachers and I feel very isolated and very young. We feel we are old enough to be treated as equals but some of the staff could not see us as adults.

In another school the breakfast program was the main feature. It was described by the student-teacher who had arrived at the school at 8.15 am every morning to assist with the provision of toast and milo for students from economically disadvantaged backgrounds. That student-teacher had a great deal to offer when the issue of poverty and its affects on students was later raised in a class session at University. Other student-teachers in the same school had become very involved with the lunchtime sporting activities of the school and proudly showed us the gymnasium and other sporting facilities.

The student-teachers who had lived in a school with a high number of students from non English speaking backgrounds had made a video of the school, its staff and students. They highlighted the multicultural nature of the school and showed us snippets of the classes with which they had worked.

The performing arts centre was the focus for another group of student-teachers. They were most impressed with the way in which large numbers of students and staff had worked together to produce a first class musical production. They stressed the range of ways in which students were involved - in performing both on stage and in the orchestra, as backstage workers in make-up, costume and scenery.

The visits to the four schools are an essential part of the school-based program. They serve to highlight the special relationship each group of student-teachers has developed with the staff and students in the school where they have worked for their extended practicum. They also help to highlight the differences in each of the schools and to establish a basis for sharing understandings once the student-teacher return to the university. It was also an important step in re-establishing the whole group in preparation for university based seminars and classes.

Overview

The success of the school-based program is as a result of number of inter-related factors. Two of these are particularly important. The first is that the extended practicum is not just an attempt to give student-teachers more teaching practice, it is to give them a whole school experience. Second the student-teachers are genuinely seen by both their school and university supervisors as being full-time teachers. To fully appreciate these two factors the value of time needs to be recognised.

Because of the length of time spent in the school, the student-teachers are afforded more freedom in their approach to their teaching. They are not immediately under pressure to perform in order to meet assessment

requirements. Through the additional time available they are able to take in more from their environment. They do not feel so compelled to rush from one lesson to the next compressing all of their experiences, good and not so good, into a package to (perhaps) unwrap later. They have the time to revisit their experiences so that the risks they choose to take are not risks in terms of assessment, but are risks in terms of learning more about their teaching and learning. Time becomes an important aspect of the context of being a teacher in a school; they are not visitors attempting to capture a fleeting glimpse of school life, rather they are given the time to appreciate the continuous learning opportunities available to them.

Finally, the extra time available through the extended school practicum offers an opportunity for the student-teachers to develop more substantial relationships with their school and university supervisors, as well as with their colleagues. Through this they are better supported in their endeavours as they explore the relationships between their views of learning and their practices in teaching.

Conclusion

Both the school-based program and the teaching portfolios are attempts to help the student-teachers in the Dip. Ed. course at Monash University take more responsibility for their learning about teaching. Common to both approaches is the need for the student-teachers to reflect on their experiences so that they learn to reconsider, better articulate and understand what is involved in quality learning.

In both cases, the student-teachers' own experiences and the sense they make of them are the focus for their learning. As they are given opportunities to learn with and from one another in a variety of situations, they are challenged to become more conscious of their views and to make that which is often tacit in their understanding more explicit.

Quality learning requires time and reflection on experience. The school-based program and the teaching portfolios attempt to do this by supporting student-teachers as they struggle individually and collectively to better understand the complex nature of the learning environment in which they will be teaching. To do this there is an onus on the student-teachers and their teacher educators to be active participants in learning, not passive recipients of information.

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Appendix 1: Examples of portfolio items.

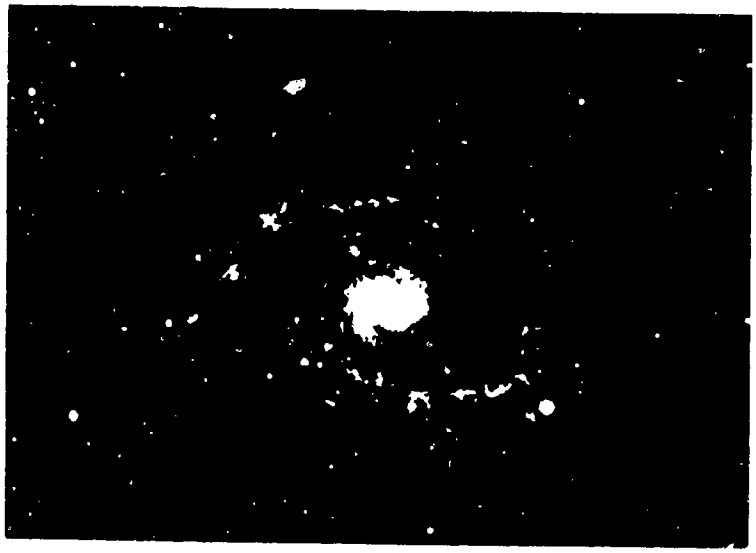
All students have their own skills and abilities and as such are valuable individuals.

It is a teacher's job to support and guide students' personal development (and never to assume limitations in student potential).

A teacher should encourage students to be responsible for their own learning and behaviour.

ASTRONOMY TECHNIQUE COURSE

I designed and conducted a two-hour session which introduced both astronomy and its teaching at secondary level to other Diploma of Education students. This included demonstrations, activities and a review of teaching resources.



COMMENTS:

- The popularity of this topic highlights how vital it is to generate and maintain student interest.

- Student interest can be achieved by introducing challenging ideas and relating teaching to students' personal experience or interests.

VCE PHYSICS UNIT OF WORK

In conjunction with another Physics Method student, I designed and prepared a unit of work on **STRUCTURES AND MATERIALS: Bridges and Buildings**. This included teaching resources and a complete lesson by lesson teaching/learning sequence.

HOBART

TASMANIA

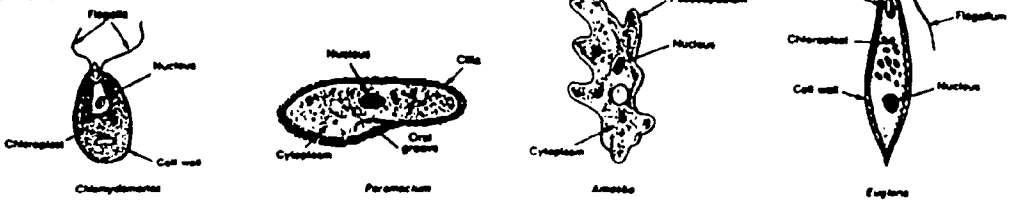
COMMENTS:

- Creating **"the need to know"** for students, is a key to interesting and involving the students in the work.
- To achieve this, the unit was based around a series of questions relevant to students. For example: *How do you go about building a structure that won't fall down?*

BIOLOGY PRACTICAL

When I taught the topic of CELLS in Year 9 Science, one of the practical exercises I designed involved students viewing micro-organisms in pond water, with the aid of a microscope.

To help you in your investigation, the following are diagrams of single-celled organisms that are usually present in pond water. See if you can recognise any of them.



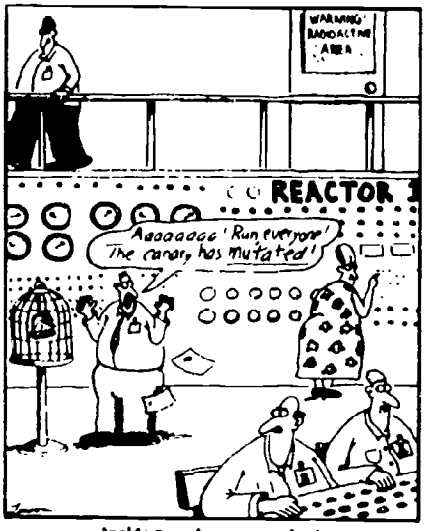
COMMENTS:

- I found some of the most direct benefits of the practical exercise to be: student enjoyment; cooperative learning; a concrete, "hands-on" approach (particularly beneficial for some students); the addition of variety and reinforcement to the topic.

- These benefits can be utilised by basing a topic around practical exercises and examples which have clear, logical objectives.

CARTOON FILE

As a teaching resource, I have made a collection of cartoons, referenced by topic.



Inside a nuclear power plant

COMMENTS:

- Cartoons can often be good starting points for class discussion, particularly when they illustrate physically impossible situations.

PROBING STUDENT UNDERSTANDING

Prior to formal teaching of science, students often have a complex understanding structure which may be quite different from the scientific view.

This exercise involved: pre-testing and interviewing students (in order to probe and challenge their alternative conceptions); and an analysis of the process.

8. Does our Sun have any gravity? Why do you say this?

no because it's too hot.

6. How far does the earth's gravity extend above the earth's surface? What is your evidence for your answer?

it extends to the end of our atmosphere. if you jump from a spaceship when your out of our atmosphere you will just drift away

COMMENTS:

- A knowledge of students' alternative conceptions allows a teacher to challenge these views and get students to re-construct their understanding. Class discussions and POE's are particularly suitable for this.

- Failure to address students' prior conceptions can lead to surface understanding sufficient only for dealing with contextually familiar situations and leading to the use of non-scientific ideas in other situations.

Appendix 2: Interview protocol

1. How do you feel the Stream 3 program is going? What do you think of it?

2. How would you describe the Stream 3 approach to teaching and learning?

3. Can you think of any examples of teaching and learning that you think are interesting from the Stream 3 program?

4. What were expectations of Dip.Ed. before your joined the course? How do you think they have changed? Why?

5. What do you think the course should do for you? How should it change?

6. What have you found most beneficial in the course?

7. What ways have you learnt through the Stream 3 program?

8. What is the Stream 3 approach to assessment? How do you feel about that?

9. What are the Stream 3 tutorials like? How do they affect your view of learning to teach science?

10. What would you see as the strengths and weaknesses of Stream 3?

11. How have you found the portfolio task?

12. How are portfolios approached in tutorials?

13. What sort of products are you producing?

14. What is the purpose of portfolios? How would you describe the portfolio to someone else?

15. What value do you place on the portfolio?

16. What do you think is the point of portfolios?

17. How do portfolios fit in with Stream 3, assessment, teaching and learning?

Appendix 3: Portfolio questionnaire.

SECTION 1: The Process of the Teaching Portfolio

1. When did you start working on your portfolio and what prompted it?
2. What were your expectations of the teaching portfolio?
3. How would you describe your approach to the teaching portfolio? (Did you take the task seriously?)
4. How would you describe the value of the process?
   a) Was the teaching portfolio a valuable process?
   b) Is it worth doing? Why?
5. a) What did you see as the role of the Stream 3 tutorials?
   b) Is this appropriate? What suggestions would you have to improve the process.

Section 2: The Teaching Portfolio - the Product

1. What did you include in your teaching portfolio?
2. Why did you include the things mentioned above?
3. How did you go about organising your teaching portfolio?
4. What role do you see the portfolio having?
5. Have you used the portfolio in any way? Explain.
6. Do you see the portfolio having a role in the future? Explain. (Why/Why not?)