Student Perceptions of Science in a Middle School: The impact of aesthetics, affordance, agency and position

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Abstract

Research undertaken into student engagement in Science has placed emphasis heavily on scientific literacy and achievement. This study extends such work by exploring, ethnographically, student appreciation of and engagement with their normative experiences of Science education during the Middle Years of school. The research was directed at gathering data with the aim of identifying student perceptions of the Science learning environment in terms of its physical and social dimensions. Years 7 and 9 students from a government secondary college provided accounts of their perceptions of the Science learning environment in Personal Meaning Maps, photography and semi-structured interviews. Presented here are two individual cases that highlight factors that the learners claim influence their engagement in, and appreciation for, Science at school. These cases indicate the factors identified as important physical dimensions seen by students to be limited to the Science classroom. Social dimensions, particularly the relationship between the teacher and students, were identified as significant by these students. The findings of this study suggest that students expect and require access to effective learning spaces, equipment and effective instruction via improved classroom environments if current levels of engagement in, and appreciation for, Science are to be enhanced.

Introduction

Students come to secondary school with a pre-established aesthetic conception of Science. In the everyday world there are images of Science coming from the media, family, primary school education and visits to Science based venues such as museums or zoos. The regard students have for Science when beginning their secondary education involves these prior experiences, experiences that often provide “connections to others, to the earth and to ideas” (Girod & Wong, 2002; p. 199). As students are exposed to Science in more formal settings such as Science classrooms or laboratories, there is the potential for evolution in their appreciation for Science (Sharma, 2010). The experiences they have when learning Science may inspire them to further inquiry into the questions and projects they invest in or, alternatively, leave them without enthusiasm for the lessons to come (Dewey, 1934; Girod & Wong, 2002).

The places where Science learning occurs are complex but can be described usefully in terms that capture the salient features of the social-materiality of place, namely, the perceptual, political, ideological, sociological and the ecological (Gruenewald, 2003). The Science learning environment defined in this way includes the architecture of the buildings and classrooms, the fixtures within the rooms, the grounds outside, the people with whom they work and is entered into and negotiated differently by the individuals and collectives within it. The Science learning environment is not static, it continually changes in response to interactions that occur between the people, artefacts and spaces available (Dovey, 2008; Gibson, 1979). The sense of place students develop for the Science learning environment interweave images and ideas they bring with them and develop over time through social and sensory experiences (Pred, 1983).

The research undertaken for this study was designed to consider students’ perceptions of the place that is the Science learning environment in the terms outlined above. The questions addressed by the study were:
• What is the relationship between the people, places and artefacts associated with Science education?
• What affordances are provided to students by the material and social within the Science learning environment?
• How are students positioned by the people, places and artefacts in the Science learning environment?

These questions were designed to identify links between the Science learning environment and student engagement with and appreciation of Science.

The Science Learning Environment

Research into the classroom environment presents two recurrent discourses: the psychosocial relationship between students and their environment (e.g. Ferguson & Fraser, 1998; Fraser, 1986; Velayutham & Aldridge, 2013; Waldrip & Fraser, 2007) and the relationship between architects and educators (e.g. Cleveland & Woodman, 2009; Dewey, 1934/2009; Jilk, 2005; McGregor, 2004a; McGregor, 2004b; Tanner & Lackney, 2006; Walden, 2009). The research presented here, by evoking the ecological approach sketched earlier, seeks to offer unity as well as extension to such descriptions of learning environments with the view to understanding student engagement with and appreciation for Science.

Distinguishing between site, space and place

The Science learning environment is the entwining of spaces and places, the interaction between all organisms and forms present. This site of Science learning may, in line with Schatzki’s definition, be considered as the “…arenas or broader sets of phenomena as part of which something – a building, an institution an event – exists or occurs” (Schatzki, 2005, pp.467-468). It includes the buildings in which Science learning occurs, the inclusion of the Science room as part of the whole, surrounded by other rooms and open to view (Dovey, 2008). The physical structures, the buildings and rooms, the artefacts including the tools used for experiments, the posters and models present for stimulation and the books for learning all interact with each other and the people moving into this environment. The resulting ecology which is the relationship between the parts of this whole, create a site that is a context in which an event occurs; it is temporal but need not be spatial (Schatzki, 2005).

While the terms space and place have been used frequently in the literature, their definitions often overlap. Something of this union is captured in Dewey’s work, wherein space is taken as “room”, a reference to the physical dimensions themselves or the extent to which space is available: “Space is room, Raum, and room is roominess, a chance to be, live and move (Dewey, 1934, p. 217). The available space also refers to time for “without time, just as without physical space, an individual may feel oppressed” (Dewey, 1934, p. 217).

The spatiality of the Science learning environment considers the “room” at a given time, a space-time construct that describes the “social production and meaning of space” (McGregor, 2004, p. 13). Spatiality, as with place, is not fixed for a given classroom, a group of students or a teacher: it is affected by temporality.

Place is a political arrangement within a space (Fisher, 2004). The physical location of an individual in the Science learning environment provides a political as well as aesthetic vision of the place, leading to the creation of an image of this place in terms of the colours, decorations and spatial arrangement of the objects that includes the social positions of the people present within it (Gibson, 1979). This vision is unique to that individual but available to others through social practices and shared material affordances. The location of the individual may impact on the affordances offered by signs within this space, especially with respect to the people who play agential roles (including teachers or the peer group); the individual position or perspective being granted by the uniqueness of personal experience: “My experience of a site might be very different from yours and thus produce a very different place” (Gruenewald, 2003, p. 622). Place is not static, however, but is continually changing in response to interactions that occur between the people, artefacts and spaces available (Dovey, 2008; Gibson, 1979; Thrift, 1997). Thus, the place referred to by a person – the Science learner – is, by its nature, dynamic.
The Science Classroom

Science classrooms are specialised spaces that allow for the teaching and learning of theoretical concepts and the completion of experimental and practical work. To facilitate these lessons, rooms are fitted with workbenches and wet areas together with the standard classroom tables and chairs. The presence and arrangement of these features have the potential to influence students’ sense of place as they see and work with them over time (Heft, 2003; Pred, 1983). The design and arrangement of furniture in the Science classroom may be comfortable during theory lessons but, when used for practical activities, may cause the room to become crowded and difficult to negotiate (Miller and Cunningham, 2009). The interactions between these features and fittings and the space provided for Science learning may result in the production of social and political formations (Gruenewald, 2003; hooks, 1990), leading to marginalisation or inclusion of individuals or groups as they negotiate a place that is theirs and where they are comfortable to work.

The functionality of Science classrooms may also be significant in the minds of the students (Heft, 1985). When working in the Science classroom, students will be seeking a place that affords them the opportunity to complete the activities required. This place may include the practical bench, fixed with gas and water taps, but it may also be the bench that allows for unimpeded movement, the one that is closest to the location from which materials are distributed or is the place furthest from the teacher thus allowing the students to develop their own strategies for using equipment or solving problems.

The design of the buildings and rooms, the spatial arrangement of furniture, the colours and textures, displays and safety within these spaces, together with the relationships between the people present have the potential to influence individuals regarding their relationship to school (Smyers, Smith & Standish, 2007) and Science in particular (Sanoff, Pasalar & Hashas, 2001). School buildings vary in their construction when viewed from the outside but their form is usually similar: a rectangular building with a central corridor and rooms off to each side (Akinsanmi, 2012; Dovey, 2008). Traditional schools have been designed to provide a workspace within classrooms for each student:

[R]ows of ugly desks placed in geometrical order, crowded together so that there shall be as little moving room as possible, desks almost all of the same size, with just enough space to hold books, pencils, and paper and add a table, some chairs, the bare walls, and possibly a few pictures, we can reconstruct the only educational activity that can go on in such a place. It is all made for listening. (Dewey, 1915, pp. 21-22).

While the typical classroom may fit the description given by Dewey above, schools of the 21st century are expected to create a learning environment that is nurturing and that stimulates emotional well-being (Glover, 1998). Contemporary teaching principles encourage students to ask questions, hypothesise and communicate their ideas and beliefs (Fisher, in press). To assist in this aim, Science educators are encouraged to create learning environments that “promote in-depth learning, foster curiosity and enhance the interrelationship between Science and the greater environment” (Butin, 2000, p. 2). The textural features of the Science learning environment, the colours and decorations, may invite students into this place and allow them to feel “at home” (hooks, 1990; Martusiewicz, 2001). This home refers to a place where students are comfortable and secure, motivated and keen to achieve (Glover, Burns, Butler & Patton, 1998); a place that is an educational agent where students encounter “things” and become educated by them (Martin, 2011). The removal of the “teaching wall” and the provision of comfortable furniture may assist in the creation of an ambience reminiscent of home, a place where students feel “emotionally safe, comfortable and visually stimulat(ed)” (Akinsanmi, 2012, paragraph 8).

Student Perceptions

Research into the psychosocial learning environment has shown that “students’ perceptions of the learning environment are a key determinant of students’ academic and affective learning outcomes” (Velayutham & Aldridge, 2012, p. 520). While the literature frequently links the Science learning environment to the achievement of a range of educational outcomes (e.g. Fraser, 1998; Velayutham & Aldridge, 2012), there is also concern that students are not undertaking the study of Science beyond compulsory years (Tytler, 2007). This research is focussed on student perceptions of the Science
learning environment incorporating the psychosocial and material factors that may influence the appreciation of and engagement with Science education during the middle years.

The initial perception of the Science classroom will be based both on what students can perceive and what they have been told about this environment. While both Gibson (1979) and Reed (1991) have made extensive claims about the distinction between direct (firsthand experience) and indirect (secondhand experience) perception, it is important to consider Windsor’s view that our perception of signs is more to do with the affordances they provide rather than their actual structure or location (Windsor, 2004). After Windsor, affordance will be defined as the state of affairs in which an object or event will allow varied things to occur based upon the requirements and capabilities of the perceiver. Also assumed is Windsor’s view that, even when a student is considering the referent information provided to them, they will not arbitrate but make a direct perception of the affordance given.

The Participants

This paper will focus on the accounts and artefacts provided by two students from the Regent’s Park Campus of Winton College¹, a multi-campus, government secondary college in the western suburbs of Melbourne. Julianne and Srdjan are both Year 9 students who have been students at Winton College since the beginning of Year 7. They are in the same class at the time of the interviews but have had different teachers in the past.

Method

This research is based on student perceptions of their experiences in the Science learning environment (Punch, 2009). An iterative ethnographic approach has been taken in an attempt to gain insight into student perceptions of the Science learning environment by considering how students view the spaces and places of Science learning. This approach was multi-modal, incorporating the use of Personal Meaning Maps (PMMs), photography and semi-structured interviews; consideration of the interactions that occur around students and between them and the space, place, artefacts and others, have also been taken into account. An ethnographic approach has been utilised as it provides “a methodology that may be located within interpretivist, hermeneutic, or phenomenological traditions” (Sykes & Treleaven, 2009, p218). The use of discourse, agency and structures has allowed for an insight into the ecology of the Science learning environment (Busier et al., 1997; O’Reilly, 2009; Sykes & Treleaven, 2009).

The ethnographic approach is explicitly qualitative in nature and, as such, relies much more upon the degree to which the data does justice to the lived experiences and situation of the participants and the researchers than it does to the statistical significance of the data from which inferences of this study are drawn. Whilst this present paper presents two case studies – that is, the presentation of data from two participants in the research – the analysis and interpretation of these data are drawn from the researchers’ ongoing and participatory involvement in the learning environments under investigation. The paper, therefore, aims to foreground the salient methodological and analytic insights of the larger study with reference to only two participants; bearing in mind that the significance of the two case studies presented here extend beyond the two individuals cited.

Personal Meaning Maps and Interviews

Personal Meaning Maps (PMMs) and interviews were used in the first phase of data collection. This research strategy was selected as it explores both the affective and cognitive dimensions of the phenomena under investigation (Evans, 2007; Lelliott, 2008). Personal Meaning Mapping shares features with mind mapping and concept mapping but, while these tools encourage links between concepts PMMs have been developed to uncover and express people’s conceptions and perceptions (Evans, 2007) by considering individuals’ emotions, attitudes and beliefs (Falk, 1999). Students

¹ The names of the College and its Campuses together with those of the students and teachers have been changed to protect the privacy of all members of the College Community.
worked independently to construct their own PMM. Time was provided for students to reflect upon their original PMM and make additions or revisions as required.

After completion, the PMMs were collected and reviewed and interview questions formulated in response to the information provided. Open-ended questions were also prepared while further questions were asked during semi-structured interviews if clarification was required or to encourage a more explicit response. Interviews were audio-recorded and transcribed.

Data Analysis

Data from the PMMs was reviewed for the construction of questions to be used during the interview process. Some data was linked together due to the similar nature of information provided. The phrasing of the questions was influenced by the age, year level and presentation of the participants. Interviews began with general questions about the “headings” on the PMMs before moving to more specific questions about the data presented.

Interviews utilising photographic data were more conversational, with students asked to provide commentary on the pictures they had taken. Interviews were semi-structured: a strategy used to give participants the opportunity to describe the significance of the objects and locations of focus.

Interview data were coded to reveal categories of student perceptions of their Science learning environment. The data provided after the creation of the PMMs was analysed in light of emergent themes, and then interpreted in conjunction with the data provided by each participant in relation to their photographs. The themes were used to correlate data with the research questions. Quotations representing common themes within the data were collected and interpreted in response to the research questions (Nilsson & van Driel, 2011).

Results and Discussion

Students’ perceptions of their Science learning environment were accessed through written and spoken dialogue including the para-verbal usage. A range of methods was employed to gain insight into the material and social aspects that influenced their attitude towards Science. While the two students were both in Year 9 and had been taught by some of the same teachers, their appreciation of and engagement with Science learning was significantly different. The Personal Meaning Maps (PMMs), interviews and photographs taken by Julianne and Srdjan provided rich insight into the perceptions of students in relation to the Science learning environment. While the aspects of the space and themes each identified were similar in their PMMs, other data provided the means to distinguish between their individual perceptions. Their insights into the Science learning environment did change during the time of data collection as they progressed from Year 9 into Year 10.

Srdjan

Srdjan’s Personal Meaning Map (PMM) was divided into two sections, one devoted to comments about the lack of cleanliness in the Science classrooms and the other presenting brief statements describing facilities within the Science classrooms and some aspects related to curriculum. No direct reference was made to the psychosocial aspects of the Science learning environment.

During the interview Srdjan remained focused on the cleanliness and maintenance of the Science classrooms and facilities:

Researcher (R): OK how do you find that room itself?
Srdjan (S): I reckon it’s cleaner than the other Science rooms. [R: M’mm.] S: Like better equipment and that. They’re not like dirty tables and that. [R: Good.]
S: Chairs are not, like broken and that.
R: Are the chairs in the other Science rooms broken or are you talking about chairs and things in other classrooms around the school?
S: No the chairs in the other class … other Science classrooms.
Srdjan took nine photographs for this study, many of these continuing with this focus on evidence of material decay and neglect. Three of the photographs taken showed parts of the ceiling and walls in the Science classroom:

S: Oh well, the classroom doesn’t look in too good a shape and like, the school doesn’t want to fix it and it’s just going to keep on, like, breaking.
R: So whereabouts are these... do you remember where these holes or marks are?
S: This one’s on the roof... [R: M’mm.] And these two are on the walls, same wall I think or near it, yeah.
R: OK, now the damage in the roof, how do you think that was caused? S: By the rain it looks like.
R: Does a bit. What about the other two? S: This one looks like someone has done it. [R: M’mm.] I don’t know how it happened. I don’t know what could’ve done that. And like, it would make the classroom look better if everything was fixed and like painted off. It doesn’t look like, rundown.
R: Yep. Does that make you feel better when you’re working in a place that is well maintained?
S: ... ... What was the question again?
R: Does it make you feel better about doing work if you’re in a place that’s well maintained?
S: If there was like, if I don’t have to worry about Science ‘because the walls are like broken, ’cause then it makes me think that the teachers don’t care ... [R: Yep...] ...or like the school doesn’t care about the Science.
R: OK. So do you see marks like this or damage like this in other buildings as well or more in Science?
S: More in Science – definitely!

Srdjan elaborated on ideas about the state of the classroom, the role of teachers and continued as he studied a photograph of graffiti on the walls in one Science classroom:

S: Oh...I reckon it shows that some kids are bored in class with what the
teachers are teaching and like I don’t get how they can like, write on the wall and the teacher’s desk is right here (tapping on desk) and the teachers don’t notice.

R: Yeah, so you’re thinking is this bad - no I’ll ask that again. Is this bad on the part of the student or the teacher or both?

S: I’d say both because students should know not to tag walls but teachers - if they do like see students they should do something about it and not just like sit there and not even look and even if they walk past it once like just going to their desk and if they see and they don’t know just keep walking past it. Same as the tables – well the new tables at least.

R: Yep. Have they got much graffiti on them, the new ones?

S: No, they don’t.

Harré’s discussion on ethogenic positioning reminds us that one of the social orders within society is the “expressive order” (Harré, 1983 p. 69) which is concerned with the “organisation of honour” (Harré, 1983 p69). Srdjan’s comments as an actor within the Science learning environment demonstrate an awareness of a belief system whereby the Science classrooms should be treated with care and respect. During the interviews he presents himself as a responsible and respectful person, a presentation that is at odds with his admission to not always doing the right thing. The attitude and behaviour expressed in class may be a response to the belief systems of the collective (Harré, 1983) or in response to the signs presented by the teacher and the school in relation to the Science learning environment.

**Figure 2.** The triadic relationship within the science learning environment showing how the student – actor and the environment are in a meaningful relationship by the perception of and action upon stimulus information.
These signs, such as teachers not responding to the defacing of school property, will be interpreted over space and time (Gibson & Pick, 2000) and may lead to the perception that all students may be afforded the opportunity to behave in a similar fashion (Windsor, 2004). Gibson (1979) presented such an ecological view of perception in a triadic form.

Srdjan, through the data presented on his PMM, in photographs and during interviews, perceives the Science learning environment to be unimportant within the College. The lack of repair to these rooms and the perception that English and Mathematics are more important than Science is an example of an inter-group position that leads students to rank subjects by importance rather than to appreciate their differences (Harré, Moghaddam, Cairnie et al., 2009).

Julianne

Julianne’s Personal Meaning Map (PMM) identified the role of the teacher in conjunction with the development and implementation of curriculum as being of greatest significance to her perception of the Science learning environment. Her comments on the PMM referred to the influence of teachers on student appreciation of and engagement with Science. Julianne acknowledged a number of material aspects of the Science learning environment that affected her Science experience. These include the size of the classrooms, lighting, temperature, noise levels and arrangement of furniture. No information was provided about the interactions between students and their role on her perception of this place.

Figure 3. Julianne’s Personal Meaning Map

The Science rooms at the Regent’s Park Campus of Winton College are located in a “Science block” that is separate to all other buildings on this site. Julianne was asked about people’s ownership of and relationship with that building and its rooms:

Researcher (R): Do you think any of the teachers have any ownership of that area; that corridor of that building?
Julianne (J): Oh, umm, I know Miss Smith loves her room in the corner. She absolutely adores it. I can just see it when I walk through but I don’t think any of the other teachers like... most of them tend to like only have classes in there, that’s it so...and like S block isn’t actually like a team it’s just the block where we have science so they could like – yeah there’s not many spaces there for them to like personalise as themselves because you like share the rooms anyway. So with the L team like when they put posters up like that it’s kind of like very rare and I really doubt they would have all our science things up there because I think – like it was our aim to … to cover – like this
is our science room we’re going to make it fun, colourful but we never actually got to put it up there for some reason, I don’t know why.

Through this dialogue, Julianne positions teachers other than Miss Smith as not taking ownership of the Science block or its classrooms. There is the suggestion that teachers have not developed or maintained a relationship with the Science learning environment, a view which she elaborates later in the conversation in relation to the creation and maintenance of displays.

R: OK. And the display case?
J: Display case. I understand that they display work, it’s just when you think of a display case in a museum and you think they like show artefacts and that skull, human skull and everything like that so it would be a cool like if it had better like fossils like or maybe something that would be more interesting. [R: Yep.] Other than work because work can go on the board and then this can have like things you study.

R: The things that are in there, did you make them?
J: I didn’t make them myself but I think some other classes did.

R: Have they been in there for a long time those objects?
J: Oh, no. Actually, I ... oh ... I think there were volcanos in there before that.

R: So there’s been a little bit of a change. [J: Yeah.] Is that important?
J: I guess it is because if you just have the same volcano up there and it would be like oh yeah, just the same old classroom, nothing new, nothing interesting and then … It’s … but it’s better to change it according to the topic but it’s hard to do because you have the share the room with another classes and everything so you can’t exactly have a diagram of … when you have to research the reproductive system compared to, like, Year 7 when you’re learning about atoms or something like that.

While some attempt has been made to decorate Science classrooms, teachers have made little or no effort to replace posters on a regular basis, either according to topic or as a public acknowledgement of student work. For Julianne, this is not of great importance although she believes posters relating to a particular subject or topic would be advantageous, especially to students in Years 7 and 8. By leaving posters on the walls, students are afforded the opportunity to damage these artefacts; changing them may afford an opportunity to learn or to be inspired:

R: OK. So what makes the room boring? … just the colours and...
J: M’mm, yeah, like, you could like have stuff hanging off the roof or something like that, you know like skeletons and diagrams and stuff like that, like solar systems you could just hang it off the roof that would be more fun at least.

Julianne continues this theme of teachers being agents to encourage student engagement with and appreciation of science via her discussion of the arrangement of furniture.

R: Um, do the rooms ever get re-arranged? Like the table set up [J: Ah,oh ..] … like into groups of tables?
J: Um, not in the rooms I’ve been in. Not the big – not the ones with big chairs.

R: Yep, no that’s all right.
J: I think Miss Smith room is already set out in a wonderfully creative way. There are groups and then other groups and – I don’t know how she manages it but – ‘cos I’ve never been in her class but I’ve seen... [R: OK...] ...but I’ve seen it and it looks very creative and everything.

During the conversation, Julianne becomes more animated and enthusiastic when speaking about Miss Smith’s classroom. The variety of signs available to students in this Science learning environment affords them access to learning opportunities including written, visual and auditory, enabling them to engage with Science learning utilising diverse stimuli (Windsor, 2004). Julianne’s tone and mode of speech indicate that she believes it is important for teachers to make the Science learning environment
vibrant, inspiring and suitable for student participation in active learning (Horne, 2004).

The interaction between students and teachers to create a positive learning environment in Science was discussed with Julianne who noted the significance of teachers being positive in their interactions. Her comments make it clear that, within the local moral order of the Science learning environment, teachers have an obligation to provide information, assistance and encouragement to all students. These actions are rights and duties that teachers are “permitted, allowed or encouraged to do; and those which one is physically and temperamentally capable of doing” (Harré & Slocum, 2001, p. 3). The exchanges between teachers and students are social acts that have the potential to influence student perceptions of the Science learning environment (Harré & Slocum, 2001). The utterance made by the teacher, including their choice of words and vocal inflection together with their location in relation to the student, may be interpreted by both the speaker and listener with the potential for different outcomes.

A Joint Perspective

The position of teachers in the Science learning environment, together with the arrangement of the furniture, works to move students away from Science as practiced in the Science classroom. The places within the Science classroom are typically organised with teachers standing at the front of the room, delivering information while students are seated in an arrangement best suited for listening (Dewey, 1934; McGregor, 2004b; Smagorinsky, 2007). This arrangement is a power structure where teachers aim to control the classroom and the learning undertaken by their students (McGregor, 2004b). Julianne and Srdjan discussed such arrangements in conjunction with the limitations it places on them within the science classroom, rooms that are typically larger than others within the school.

S: And they (tables) look way better than the ones in other classrooms because they are pretty big and they’re spacious and like you can put all your books there and all your friend’s books and they like wouldn’t even go on to them. Yes.

R: And you like having those?

S: Yeah I prefer them over the other classroom ones.

R: OK. How are they- how are those big tables arranged in a classroom? Are they in rows or set up so there’s groups of people...? S: They’re in rows, yeah.

R: It’s good to have them in rows do you think?

S: All the other Science classes, their tables are in rows, yeah, except for like one or two and it would be different to see them in like, squares but ‘cause the tables are like so big you can’t have them as squares ‘cause it would make them big like these two tables.

R: Yep. In that room, and I was with you when you took the photos the other day, there seems to be a lot of empty floor space. [S: Yeah.] Do you think that room could be set up better in terms of using the floor space?

S: Yeah, definitely.

R: Right. So what could we – what could the school do to make it better?

S: ... ... ...Mmm, maybe - maybe make like a bench – like another like another one of the science benches in the middle [R: Yep.] and, like, space for more like, students because some times when I was in science I would see, like kids sitting down because they wouldn’t have, like - like you would be in groups of like five to a table and there’s like four tables... [R: OK...]... So if like you broke it down into like threes and then maybe – if there was an extra table then like more kids could like get into the science experiment and learn more.

R: What would you like – if you had an ideal science room – what would it be like, that idea room?

J: Ideal room. M’MM. I guess it would be more open. [R: OK] : ‘Cause we have like – it’s just more closed off I don’t know why it just seems more closed off. Like really dull and stuff like that because it’s like always, you know, used for gas because we have the Bunsen burners and people turn them
on and don’t like use the gas or anything so I don’ know - my ideal science room it would be like, something less – I don’t know, boring, less boring I guess.

Space, the room to move or make a place your own was significant in this conversation. Julianne concurred with the comments about space and its impact on student participation in practical activities. Having space at a table afforded students the opportunity to create a place to learn, providing them the prospect of being an agent for learning (McGregor, 2004b). Access to artefacts such as laboratory equipment and space on which to use these items puts students in a position of power; they become part of a group where each has a role for the time allocated. Within this frame, each learner is afforded the opportunity to investigate and explore the artefacts themselves, the relationships between them and present themselves to others as scientists.

Conclusions and Implications

This study links the place and space of science learning and the relationship between Science teachers and their students to students’ appreciation for Science. The students’ aesthetic perceptions of the Science learning-environment connect to the presentation of the place itself in terms of space, cleanliness and organisation. Engagement with Science relies on student access to a space that is sufficient in size and form for a task to be attempted effectively. Ability and motivation to complete this task is enhanced by links between the Science learning environment and everyday events (Lemert & Branaman, 1997).

This study has shown that perception of Science, as a valuable and meaningful subject, is linked to student perceptions of the position placed on this subject by the school through institutional practices (Burke & Grosvenor, 2003; Dovey, 2008). Students are aware of the semiotics within the school in relation to science and will position accordingly (van Langenhove & Harré, 1999). The actions of teachers as agents for the development and promotion of science have the potential to offer inspiration to learners; they are afforded the opportunity to utilise diverse resources and thus develop skills that may allow them to be positioned as experts within their peer group. In a similar way, student engagement with and appreciation for science may diminish if the signs they perceive continue to show Science in a position of disregard within the institution (van Langenhove & Harré, 1999).

The implications of this study suggest that the places for Science learning require development and maintenance with collaboration between all stakeholders in the educational setting (Fisher, 2004). While some aspects of the Science learning environment are unlikely to change markedly (for example, the actual form of the school buildings) teachers, principals, school councils and education departments need to be increasingly aware of the ecology of the science classroom and the ways in which it shapes and transforms students’ perceptions of Science and its value.

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