Primary and secondary teachers’ perceptions of salinity curriculum materials

by Renato Schibeci, Geraldine Ditchburn, David Lake and Glenda Leslie

Teachers in Western Australia have been provided with the kit, Salinity in the Classroom: A Resource for Western Australian Schools. We report on the views of teachers’ experiences with this kit: a written survey of 63 teachers and interviews with nine teachers. Three themes emerged from the teacher responses: content, pedagogy and distribution of resources. We also reflect on ways that the science education community can contribute to improving such curriculum materials.

Introduction

The largest areas of dryland salinity are in the agricultural zone of south-west Western Australia. Groundwater levels in this zone are still rising and over 4 million hectares have areas at risk; an area that could double by 2050 (http://audit.deh.gov.au/anna/land/docs/national/Salinity_AUS.html).

Given the nature and extent of the problem in Western Australia, the WA Department of Agriculture developed, in 2001, the salinity education kit Salinity in the Classroom: A Resource for Western Australian Schools. It was launched in August 2002 and then distributed free of charge to all schools in Western Australia, all local government authorities and a range of university faculties related to either education or natural resource management.

At its inception, the outcomes proposed for the kit were to:
- provide all schools in Western Australia with year-appropriate curriculum materials covering the causes, impacts and management of salinity;
- produce a series of salinity-related student information sheets suitable for use in school projects;
- make all appropriate curriculum and student information materials available on the Internet; and,
- educate the land managers and researchers of the future about salinity and encourage students to consider career options in agriculture, natural resource management and related fields.

Education of young people about this issue is undoubtedly an important task. Educational kits such as Salinity in the Classroom have an enormous potential to provide an effective tool in awareness raising and informing and engaging the community. Ultimately, the continued control of the problem will lie with those young people who are tomorrow’s leaders.

The salinity curriculum kit

Curriculum materials, such as the salinity kit evaluated here, form an important part of the teaching-learning environment. Ball and Cohen (1996) noted that ‘reformers have often used instructional materials as a means to shape what students learn’ (p. 6).

Curriculum materials are an important influence on students’ learning experiences (for example: Grossman and Thompson, 2004; Remillard, 2000) and are thus worth studying.

The purpose of the kit was twofold: to address the issue of salinity in the context of WA, especially with regard to dryland salinity and salinity in rivers, and to encourage teachers to include issues associated with causes and prevention of salinity in their curricula.

Work on the kit started in 2001 and the kit was distributed to all WA schools in 2002. Background materials were written by personnel from the WA Department of Agriculture. All the resources (activity sheets) were collected from around Australia and adapted to address the characteristics of salinity in WA. A CD-ROM was added later and contains all the information from the kit in .pdf format, which was a more cost effective way of reproducing the materials. The video, Salt of the Earth, was produced so that students would have a visual image of salinity and includes additional information to help teachers understand salinity. Also included in the kit was the Big Book, designed as an introduction to salinity.
for younger students and to stress the importance of groups working together to manage the issue.

There were two phases in the distribution of the kit to all schools and universities. The first phase involved a letter to *Society and Environment*, *Science* and Environment Coordinators in primary and secondary schools alerting them to the subsequent distribution of the kit. Several months later, the kit was sent to principals, with a covering letter from the Environment Minister endorsing the kit. The kit was also sent to local government organisations and landcare groups through public libraries.

**Purpose of the evaluation study**

The evaluation study was commissioned by the WA Department of Agriculture. The major purpose of this component of the evaluation study was to gather information from as wide a sample of potential users as possible across a range of learning areas and year levels in a variety of school contexts – rural and urban, government and non-government – in order to gauge the extent of immersion of the kit in schools. Additional information was also sought about preferred methods of resource distribution and formats, as per the identified outcomes of the evaluation study.

With the assistance of the Agriculture Department, a provisional list of schools was drawn up for inclusion as case studies, including teacher interviews, using an agreed set of guide questions.

In-depth interviews were conducted with nine teachers (three in government and four in non-government schools) in seven schools who had used the salinity kit in the classroom. One was a rural school, and remainder in the metropolitan area. Three were primary teachers and six, secondary teachers. Each member of the Murdoch project team, using a set of guide questions, conducted the interviews. It was intended that the guide questions provide the basis for understanding the teachers’ perceptions of the strengths and weaknesses of the salinity kit and the ways in which it was used by these teachers. In some cases, more extensive interviews were conducted with these respondents to elicit additional information to supplement the teacher survey data. In these instances, the teachers were asked to comment on the preferred formats for resources, the preferred methods of resource distribution and to elaborate on the ways in which they thought the kit could maintain its relevance.

The interviews were read independently by two team members, each of whom nominated themes which emerged from this first reading. The two team members compared these themes, re-read the interviews and jointly agreed on which of the initial themes appeared to be the most significant.

Preliminary contact for telephone interviews was made by asking the school to direct the researchers to the person who would be most likely to deal with this topic. In the majority of cases, as indicated by the results, we were directed to the *Society and Environment* specialist. However, the responses from teachers suggest that salinity is actually being taught in more than the *Society and Environment* learning area.

A total of 63 teachers completed written surveys. While the sample size was appropriate in the context of this evaluation, a degree of caution should be exercised in interpreting the data. However, the information supplied by the interviewees may provide worthwhile starting points for consideration in future educational resource initiatives.

**Results of teacher survey**

**Background**

The 63 schools that teachers were drawn from were categorised as shown in Table 1. There was one teacher from each of the 63 schools. A school can be categorised in more than one way, so the total is greater than 63.

<table>
<thead>
<tr>
<th>School type</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural</td>
<td>38</td>
</tr>
<tr>
<td>State</td>
<td>21</td>
</tr>
<tr>
<td>Primary</td>
<td>7</td>
</tr>
<tr>
<td>Regional</td>
<td>6</td>
</tr>
<tr>
<td>Independent</td>
<td>5</td>
</tr>
<tr>
<td>Middle</td>
<td>22</td>
</tr>
<tr>
<td>Suburban</td>
<td>8</td>
</tr>
<tr>
<td>Catholic</td>
<td>25</td>
</tr>
<tr>
<td>Secondary</td>
<td>2</td>
</tr>
<tr>
<td>Agricultural</td>
<td>4</td>
</tr>
</tbody>
</table>

Of the 63 teachers, 58 nominated the area in which students learn about salinity specifically: Environmental Education, 4; *Society & Environment*, 27; *Science*, 17; *Agriculture*, 4; and ‘Other’, 6. The learning areas represented by the 63 teachers were: Environmental Education, 4; *Society & Environment*, 19; Generalist, 14; *Science*, 2; *Agriculture*, 8; and ‘Other’. 5. Eleven did not respond to this question. The number of agriculture teachers is low because there are relatively few agriculture teachers in the system.

The responses demonstrate that the survey did cover a wide range of schools by capturing a cross-section of rural schools in areas where salinity can be expected to be an important local issue, as well as from schools in urban areas. Data also suggest that the topic is taught across learning areas within schools. The paucity of responses may be a consequence of teachers’ busy professional lives. Alternatively, it may reflect the way in which salinity issues are perceived by the school administration.

**Kit Immersion**

Of the 63 teachers, 33 had not seen the salinity kit, and 17 only had used it in their teaching. It appears that despite the distribution of the kit throughout all schools in the state, a large proportion of teachers were not aware of its existence.

The kit has been used broadly across all age ranges with the exception of early primary. There may be a preference for use with upper primary and middle secondary classes. The survey suggests that while a number of teachers have taken the resource in isolation, in other schools its usefulness has been discussed more widely.

**Resource selection**

The survey suggests that direct communication, either by word of mouth from other teachers, or through direct mail-out to individual teachers is the most common means for teachers to find out about new resources, and teachers do not appear to use journals or textbooks for the purpose.

Communication channels where the individual was targeted as part of a small group, such as a learning area department, were only slightly less favoured than other channels of communication. These channels included both off-campus and school-based professional development, and delivery to the learning area faculty.

Table 2 summarises how teachers find out about resources.

The low reliance on email suggests that mail-outs may be treated as spam, and discarded, and pamphlets appearing on the common room table may be perceived in the same way.

There is relatively little difference in acceptance for different forms of resource packaging. The survey suggests that teachers prefer booklets to other methods of resource packaging, including loose-leaf binders.
Table 2. Finding out about resources

<table>
<thead>
<tr>
<th>In general, how do you find out about resources?</th>
<th>often</th>
<th>sometimes</th>
<th>rarely</th>
<th>never</th>
<th>blank</th>
</tr>
</thead>
<tbody>
<tr>
<td>a Individual postage to school:</td>
<td>46</td>
<td>82</td>
<td>95</td>
<td>100</td>
<td>2</td>
</tr>
<tr>
<td>b Common room table:</td>
<td>10</td>
<td>53</td>
<td>79</td>
<td>100</td>
<td>5</td>
</tr>
<tr>
<td>c Delivery to department:</td>
<td>38</td>
<td>77</td>
<td>90</td>
<td>100</td>
<td>5</td>
</tr>
<tr>
<td>d School-based professional development:</td>
<td>16</td>
<td>72</td>
<td>97</td>
<td>100</td>
<td>5</td>
</tr>
<tr>
<td>e Other professional development:</td>
<td>23</td>
<td>78</td>
<td>98</td>
<td>100</td>
<td>3</td>
</tr>
<tr>
<td>f From other teachers:</td>
<td>28</td>
<td>83</td>
<td>97</td>
<td>100</td>
<td>3</td>
</tr>
<tr>
<td>g Email:</td>
<td>7</td>
<td>53</td>
<td>78</td>
<td>100</td>
<td>5</td>
</tr>
<tr>
<td>h Subscription journals and magazines:</td>
<td>17</td>
<td>56</td>
<td>88</td>
<td>100</td>
<td>4</td>
</tr>
<tr>
<td>i Textbooks:</td>
<td>14</td>
<td>56</td>
<td>91</td>
<td>100</td>
<td>6</td>
</tr>
<tr>
<td>j Internet search:</td>
<td>25</td>
<td>77</td>
<td>98</td>
<td>100</td>
<td>6</td>
</tr>
<tr>
<td>k Interests outside school:</td>
<td>27</td>
<td>68</td>
<td>92</td>
<td>100</td>
<td>4</td>
</tr>
</tbody>
</table>

Results are expressed as cumulative percentages

It may be that photocopying a book page, even where changes of dimension are needed, is easier than removing and returning pages from a loose-leaf kit. However, there may have also been some degree of confusion over the term ‘booklet’. Similarly, the relative lack of acceptance of CDs may be attributed to the simplicity of accessing material, both in the number of steps required and the need for several pieces of working technology. Table 3 provides data on the preferred types of resources teachers use in their teaching. Teachers reported a strong reliance on materials that they could adapt for their own purposes: content specific background information; ideas to base lessons on; and videotapes.

Table 3. Accessing resource types

<table>
<thead>
<tr>
<th>In general, how easy is it for you to access and use resources of the types below?</th>
<th>very easy</th>
<th>easy</th>
<th>hard</th>
<th>impossible</th>
<th>blank</th>
</tr>
</thead>
<tbody>
<tr>
<td>a Booklets:</td>
<td>38</td>
<td>80</td>
<td>100</td>
<td>100</td>
<td>2</td>
</tr>
<tr>
<td>b CD:</td>
<td>21</td>
<td>75</td>
<td>97</td>
<td>100</td>
<td>2</td>
</tr>
<tr>
<td>c Internet:</td>
<td>36</td>
<td>80</td>
<td>98</td>
<td>100</td>
<td>2</td>
</tr>
<tr>
<td>d Loose leaf kits:</td>
<td>28</td>
<td>75</td>
<td>100</td>
<td>100</td>
<td>3</td>
</tr>
</tbody>
</table>

Results are expressed as cumulative percentages

Of less importance were the fully packaged lessons in the form of lesson plans with worksheets, ready to use worksheets, and various pre-packaged activity kits. The data strongly suggest that teachers value their role in formulating how material will be presented in their class, and adapting it to reflect their goals for the class. The results also suggest that the days of audiocassettes are over, while acceptance of computer-based materials is on the rise.

Table 4 summarises teacher use of resources.

Teacher interviews

Teachers’ responses to the Salinity in the Classroom Folder

A large part of the initial phase of the interview centred on the teachers’ use of various aspects of the salinity kit. In all cases the teachers found that the kit was worthwhile with one going so far as to say that it is saving my life. In particular, the teachers found that the comprehensive range of activities, the links to the Curriculum Framework and the ‘accessories’ (CD-ROM, Video, Big Book) provided sufficient material from which to develop their programs. Another theme that emerged was the issue of credibility. Indeed, several teachers commented that the credibility and reliability of the resource was not in question given that it was an initiative of the Department of Agriculture so they perceived that the materials were grounded in current scientific thought and evidence. As some teachers were aware of their own lack of content knowledge of salinity, this was an important consideration that gave them confidence to investigate the issue of salinity with their students. Here, teachers commented on the usefulness of Section 2 of the Kit – Background Information – that provided valuable information that assisted them in gaining a greater understanding of issues associated with salinity.

In our sample of teachers, the kit was used for periods of between two and seven weeks and in a variety of contexts – from middle primary to Year 12 and in both Science and Society and Environment learning areas. There was only one instance in our study of a teacher in a primary school using the kit in an integrated way across three learning areas. None of the secondary teachers collaborated across faculties to design programs.

Further, in most cases, the qualitative data showed that the majority of the teachers developed their curricula on salinity in the context of broader environmental issues program, rather than as a stand-alone topic. The most common part of the kit that was used by teachers was Section Four, which dealt with the middle childhood years (typically Years 4 to 6). Generally teachers selected the parts in this section that were relevant to then and their students, their preferred learning styles (both the teachers’ and the students’) and the demands of the learning area. The worksheets were the most common resource used in the kit and these were either adapted by the teachers or photocopied without alterations. There also appeared to be a slight difference between Society and Environment and Science teachers in the selection of activities, with Society and Environment teachers generally preferring the puzzles, games and diagrams, cartoons and tables and science teachers, not surprisingly, focusing more on the experiments. One science teacher commented that she ignored the ‘non-scientific’ aspects of the kit, particularly the drama exercises because it’s just me not being particularly comfortable with role-plays. This teacher also indicated that she liked the experiments. Another teacher, a mathematics teacher who was teaching science said, I like the way it is structured and it has got activities and follow up work and I think it is an excellent resource.

In contrast, several non-science teachers, including the primary teachers, noted that they did not have the necessary equipment to undertake some of the experiments, despite the fact that they saw these experiments as relevant to the students’ learning.

In terms of content, a teacher in a rural district high school commented that an important asset of the video was the fact that real people (rather than scientists!) were featured and that local examples were provided:

... the video, up to date, local, relevant, not just scientists talking, real people talking and the kids responded that it really well because they knew the areas involved and they could see well this isn’t just out there, you know, this relates to us.
Table 4. Teacher use of resource types

<table>
<thead>
<tr>
<th></th>
<th>this week</th>
<th>this month</th>
<th>this term</th>
<th>this year</th>
<th>never</th>
<th>blank</th>
</tr>
</thead>
<tbody>
<tr>
<td>a Videotapes:</td>
<td>58</td>
<td>79</td>
<td>89</td>
<td>100</td>
<td>100</td>
<td>1</td>
</tr>
<tr>
<td>b Audio tapes:</td>
<td>3</td>
<td>12</td>
<td>32</td>
<td>79</td>
<td>100</td>
<td>29</td>
</tr>
<tr>
<td>c Posters:</td>
<td>34</td>
<td>56</td>
<td>80</td>
<td>98</td>
<td>100</td>
<td>2</td>
</tr>
<tr>
<td>d Computer activities/games:</td>
<td>35</td>
<td>61</td>
<td>81</td>
<td>94</td>
<td>100</td>
<td>9</td>
</tr>
<tr>
<td>e Lesson plans with worksheets:</td>
<td>55</td>
<td>78</td>
<td>87</td>
<td>95</td>
<td>100</td>
<td>3</td>
</tr>
<tr>
<td>f Content-specific background information:</td>
<td>62</td>
<td>92</td>
<td>98</td>
<td>100</td>
<td>100</td>
<td>3</td>
</tr>
<tr>
<td>g Ideas to base lesson activities on:</td>
<td>65</td>
<td>85</td>
<td>95</td>
<td>100</td>
<td>100</td>
<td>3</td>
</tr>
<tr>
<td>h Ready to use worksheets:</td>
<td>39</td>
<td>66</td>
<td>84</td>
<td>98</td>
<td>100</td>
<td>2</td>
</tr>
<tr>
<td>i Information and activity kits:</td>
<td>16</td>
<td>54</td>
<td>75</td>
<td>93</td>
<td>100</td>
<td>2</td>
</tr>
<tr>
<td>j Complete kits including sets of equipment:</td>
<td>11</td>
<td>30</td>
<td>57</td>
<td>94</td>
<td>100</td>
<td>10</td>
</tr>
</tbody>
</table>

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While the use of the separate worksheets was by far the most common approach to using the kit, these were essentially used as the basis for further programming. In one school, the teacher ‘cut and paste’ various worksheets, games and cartoons from the kit to compile a student booklet for a Year 10 Environmental Issues unit. In two other cases involving senior Science classes, materials from the kit were used as starting points for further research activities. One teacher also noted that the kit not only provided substance but also possible direction in the flow of her broader unit on environmental issues with her Year 10 Society and Environment class by commenting that we found our true order in how the curriculum could be organised.

In terms of content, all of the teachers appreciated the comprehensive scope of the content provided in the kit, although one teacher was concerned about the ‘pitch’ of the content, which he believed was ‘too high’ for his students. A number of other teachers however were appreciative of the heavy focus on Western Australian examples to provide additional relevance. These quotes probably best summarise the feelings expressed by the teachers: The kit was a good source of information … for me and the kids … and, … As far as I am concerned it is a great little kit … and … This is proper stuff.

One teacher of a Year 5/6 class thought that the Big Book which was part of the kit was too young for my children. Another teacher mentioned that the students found the Salt Monster character in the Big Book a bit simplistic … But later this same teacher said,

I wanted to get them talking about it and, by the end of the big book, they certainly had a much better concept of what causes salinity and some strategies that you can use to reduce it. So it certainly achieved my purposes.

There were very few teachers who had used the CD-ROM, with one commenting that she did not know it existed. I didn’t even know the CD was there. CDs go missing. They get lost. One person has the CD and then whenever, you never see it again. I guess in our school we haven’t got a great storage of CDs because we don’t have a lot of computers to use so, at the moment, for our school, in this written form the hard format is much more, better for us.

Generally the feelings expressed by those who had used the CD were not as positive as those expressed about the main body of the Kit with such comments as the pictures are too small and it was very hard to photocopy and enlarge and, there needs to be separate .pdfs.

There was, however, a generally positive response to the content of the kit and teachers also found the organization of the folder easy to follow (the organization of the file – that was easy, that was great), even though one found it hard to run through fast.

Emerging themes
Three themes that have emerged from this study may be categorised as follows: Content, Pedagogy and Resource distribution.

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Emerging themes
Three themes that have emerged from this study may be categorised as follows: Content, Pedagogy and Resource distribution.
Distribution of resources
The data provide a range of suggestions for resource distribution and promotion. It is clear that there is no ‘foolproof’ method of resource distribution because of the different approaches to decision-making and the various ways in which schools are organised. It may be safe to suggest that different approaches to distribution be considered, such as email and targeting HODs in secondary schools, and targeting Principals or Librarians in primary schools.

Reflections on curriculum materials
Although not part of the evaluation team’s brief, this study raises a number of important issues about curriculum materials exemplified by the salinity kit.

Role of professional development. To what extent should such kits be teamed with a sustained, systematic professional development program? Kits without such programs may have limited (if any) impact on schools. This is an empirical issue which needs to be addressed.

Underlying approach. There is no statement in the kit about an underlying approach or framework which guided the construction of the kit, so it was not possible to evaluate the fidelity of the materials to a particular curriculum framework. It is important for curriculum developers to guide teachers by indicating explicitly the approach which underpins the materials.

Role of authority. As noted earlier, some teachers suggested the materials were credible because they were written by the Department of Agriculture. While this is a reasonable belief about the scientific aspects of the kit, it may be that kits of this kind need to emphasise the contested nature of the implications of scientific work. A professional development program tied to the kit may fruitfully provide strategies for teachers to explore these and other important issue with their students.

Government and industry will continue to fund curriculum materials. The science education community can work towards improving the usefulness of such materials for students.


References


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