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Problems experienced by teachers in their efforts to implement the ‘design and technology’ approach in the teaching of technical subjects in Zimbabwe

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Abstract
This paper is based on the findings of a tracer study conducted between March and November of 1997. The problem addressed by this study was that; although it was a fact that teachers who had gone through the Bachelor of Education degree programme in the Department of Technical Education at the University of Zimbabwe were experiencing difficulties trying to implement the ‘Design and Technology’ approach in their teaching, not many people were clear about what the actual problems were. Therefore, the main purpose of study was to cast light on this grey area. To achieve this goal, a questionnaire and an interview schedule were used with eighty six (86) teachers participating.

On completion of the study, the following problems surfaced: shortage of relevant literature (textbooks and other reference materials); shortage/lack of relevant equipment; lack of materials (e.g. metal and plastic); lack of variety in the relevant teaching aids; negative attitudes on the part of pupils, parents, fellow teachers and administrators; examination systems being too rigid in nature. During data analysis, interesting comparisons were also drawn between rural and urban schools, regarding the nature of problems. The situation was found to be worse in rural areas; especially in schools situated in remote areas.

1 Introduction and background to the problem
This paper is based on the findings of a tracer study conducted between March and November of 1997 within the Department of Technical Education at the University of Zimbabwe. Although there was a similar study being planned in the department, the study relating to this paper was slightly different. At departmental level, researchers were interested in all the six subjects in the department, while here the focus was on only two; Metal Technology and Design and Wood Technology and Design. Efforts had been made to try and combine these subjects as much as possible in most of the teaching.

Other subjects in the department include, Building Technology and Design, Agriculture, Home Economics and Technical Graphics. The study at departmental level was going to address more general issues, most of which were going to interest SIDA (Swedish International Development Agency), the authority that had funded the Bachelor of Education degree programme since inception in 1987. Now, in the study relating to this paper, focus was specifically on issues relating to how well students were settling in their teaching back in schools after graduation.

According to the department’s mission statement, one of the main areas of thrust was an intention by the department to have an impact on the curriculum. This meant an influence on the teaching of technical subjects in secondary schools. Therefore, the department adopted ‘design and technology’ as an approach.

The challenge was to move away from the traditional approach where various subjects were treated as independent entities; for example, Woodwork and Metalwork and then adopt an approach that would, unify subjects under one umbrella. This resulted in fundamental changes within the curriculum. Certain aspects had to be removed while others were going to be introduced in a give and take situation. The traditional approach
had to give way to the more progressive approach of ‘design and technology’. This became a challenge where the Department of Technical Education had to be seen doing something about it. Those who graduated from the department were to be agents of change expected to promote ‘design and technology’ in their teaching.

According to Akinpelu (1995), the field of education bristles with many thorny issues and problems in any country. Now, given the Zimbabwean context, the question was; “Were the teachers going to manage smoothly, when it was one thing to have an idea and quite another to implement it”? The answer was “NO”. Intake after intake, teachers going through the department were reported experiencing difficulties trying to implement design and technology in teaching. However, the main problem was that, not many people were clear about what the exact problems were. Even those in the department lacked knowledge regarding the actual nature of the problems. Therefore, the main purpose of the study leading to this paper was to address such a blackout of information. So, among many, members in the Department of Technical Education were going to benefit in several respects. For example it was assumed, such knowledge was going to enable them to revise and update or improve their respective subject areas in one way or another. And by so doing, this was going to mean members being able to equip their students better before going into schools. Hence to meet the purpose of this study, four objectives were set and the intention was to:

• establish contacts with prospective participants.
• compare syllabi, one for the BEd programme and that in schools.
• identify the exact problems teachers experienced in both, rural and urban schools.
• determine the patterns that existed in terms of similarities and differences between the problems encountered by teachers in urban schools and those in rural schools.

At the end, recommendations and suggestions were made for improvements and further research.

To achieve these objectives, a questionnaire and an interview schedule were used and eighty six (86) teachers drawn from five previous intakes participated. The intakes that were targeted dated back from 1994-95 down to 1988 (see Table 1). Since each intake comprised teachers from schools all over the country, the sample was assumed rich in terms of balance of representation. In a way, this meant the results were going to give a reasonably reliable picture of the situation in schools around the country.

2 The conceptual framework surrounding the problem

To put this paper into the correct conceptual framework, it is necessary to put ‘design and technology’ into the appropriate context. The issue of ‘Educational Reform and Curriculum Change’ also needs to be visited from a philosophical perspective.

In various contexts, ‘design and technology’ has been treated either, as a separate subject within the curriculum or as an approach. In Zimbabwe, the later view has prevailed. On the other hand, in countries like Botswana, it has been accommodated as an entity within the curriculum (Dingalo, 1995). However, despite a few areas of fundamental differences in terms of impact and impression within the curriculum, ‘design and technology’ would still mean more or less the same thing when it comes to the kind of orientation that one ends up with after going through the theory involved in either the subject or the approach. For example, taken either way, the underlying philosophy has to do with the promotion of ‘creativity’ and ‘problem-solving’. This implies a situation where instead of presenting learners with solutions to problems, learners are presented with problems for which they are expected to seek solutions through scientific investigation.

Looking further into ‘design’ and ‘technology’ as separate concepts, it can be argued that they both involve the domain of ‘science’. For example, for one to engage in ‘design’ as an activity or as a process, that person has to be guided by scientific principles in his/her decision making. In other words, it has to do with one’s way of thinking, thereby becoming
philosophical. On the other hand, ‘technology’ becomes scientific when principles, especially those relating to physics and chemistry are used to develop the tools, equipment and materials employed in problem-solving. Figure 1 shows a model illustrating how, design and technology could be related to science.

![Figure 1 Relating design and technology to science.](image)

Having looked at design and technology in this manner, one then sees the challenge involved in the task of trying to have such an orientation within the curriculum. In the case of Zimbabwe this challenge came at a time when there was a lot debate on education soon after independence in 1980. At that time, a lot of educational reforms and curriculum changes were suggested. One of the strongest lines of argument brought forward in support of change was that the curriculum was supposed to be relevant to Zimbabwe, given the new social order (Zvobgo, 1986). According to Barrow (1984), to argue that curriculum should be relevant or useful is effectively useless in itself, because we need to know whom it should be useful to, what purpose it should be useful for and in whose judgement it should be useful.

Going back to ‘design and technology’ as an approach in the teaching of technical subjects, the intention was to make the curriculum more useful to Zimbabwe in terms of meeting its needs, especially those relating to industrial development. So, this is the thinking that teachers qualifying from the Department of Technical Education at the University of Zimbabwe were expected to promote back in the field; hence the concern when they were reported experiencing difficulties.

3 Findings
Findings of this study were presented according to how they fitted under specific objectives as given under item 1 (Introduction and background to the problem).

a) Establishing contacts with prospective participants
To locate teachers who had gone through the various intakes over the years, the researcher obtained contact addresses from student records in the department. Initially, 209 students had been identified and efforts were made to contact them by phoning and writing. After several attempts, only eighty six (86) responded. Most of those not located were said to have moved to other schools leaving no addresses behind. Fifty five were reported to have passed away. This appeared normal, considering the time that had lapsed.

Table 1 shows numbers of students identified from each intake going by subjects while Table 2 shows the number of respondents obtained.

<table>
<thead>
<tr>
<th>Year or Period</th>
<th>Intake</th>
<th>No. of students for</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Woodwork</td>
<td>Metalwork</td>
</tr>
<tr>
<td>1988</td>
<td>1</td>
<td>22</td>
<td>23</td>
</tr>
<tr>
<td>1989 - 90</td>
<td>2</td>
<td>21</td>
<td>18</td>
</tr>
<tr>
<td>1991 - 92</td>
<td>3</td>
<td>20</td>
<td>19</td>
</tr>
<tr>
<td>1993 - 94</td>
<td>4</td>
<td>23</td>
<td>21</td>
</tr>
<tr>
<td>1995 - 96</td>
<td>5</td>
<td>19</td>
<td>22</td>
</tr>
<tr>
<td>Grand total</td>
<td></td>
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</tbody>
</table>

Table 1  Identification of intakes and the no. of students in each
Table 2  No. of respondents obtained from each intake going by subjects

<table>
<thead>
<tr>
<th>Year or Period</th>
<th>Intake</th>
<th>No. of students for</th>
<th>Total</th>
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<tr>
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<td>1989 - 90</td>
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<td>3</td>
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<tr>
<td>1991 - 92</td>
<td>3</td>
<td>13</td>
<td>9</td>
</tr>
<tr>
<td>1993 - 94</td>
<td>4</td>
<td>10</td>
<td>14</td>
</tr>
<tr>
<td>1995 - 96</td>
<td>5</td>
<td>16</td>
<td>13</td>
</tr>
<tr>
<td>Grand Total</td>
<td></td>
<td>=</td>
<td></td>
</tr>
</tbody>
</table>

Table 2  No. of respondents obtained from each intake going by subjects

from each intake, totalling 86. Of these, 49 were urban based and 37 were rural.

b) Comparison of syllabi
The main purpose of such a comparison was to check on whether there were any areas of agreement regarding the way 'design and technology' was accommodated. After a close examination, the syllabi were found basically agreeable despite differences in terms of level. They both tended to place emphasis on creativity and problem-solving, thereby promoting design and technology.

c) Problems experienced by teachers
Responses in questionnaires and during interviews revealed the following problems:

i shortage of relevant literature (textbooks and other reference materials);

ii shortage/lack of relevant equipment;

iii lack of variety on relevant teaching aids;

iv negative attitudes on the part of pupils, parents, fellow teachers and administrators; and,

v examination systems being too rigid.

Looking at these problems, nothing was really new, Zimbabwe being a developing country. However, the attitude was that although these problems were expected, the idea was to pinpoint and isolate them from other factors in order to do something about them.

d) Similarities and differences between problems encountered in rural and urban schools
Given problems highlighted in item (c), it was necessary to draw comparisons between rural and urban schools, regarding similarities and differences in the nature of problems. This was going to help create a clearer picture of the situation (see Table 3).

<table>
<thead>
<tr>
<th>Problem</th>
<th>Respondents</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>affected</td>
<td>unaffected</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Urban</td>
<td>Rural</td>
<td>Urban</td>
</tr>
<tr>
<td>1 Shortage of literature.</td>
<td>30</td>
<td>35</td>
<td>19</td>
</tr>
<tr>
<td>2 Shortage/lack of equipment.</td>
<td>10</td>
<td>22</td>
<td>39</td>
</tr>
<tr>
<td>3 Lack of materials.</td>
<td>11</td>
<td>27</td>
<td>38</td>
</tr>
<tr>
<td>4 Lack of variety on teaching aids.</td>
<td>26</td>
<td>32</td>
<td>23</td>
</tr>
<tr>
<td>5 Pupils having negative attitudes.</td>
<td>28</td>
<td>6</td>
<td>21</td>
</tr>
<tr>
<td>6 Parents having negative attitudes.</td>
<td>9</td>
<td>34</td>
<td>40</td>
</tr>
<tr>
<td>7 Fellow teachers having negative attitudes.</td>
<td>47</td>
<td>30</td>
<td>2</td>
</tr>
<tr>
<td>8 School heads having negative attitudes.</td>
<td>40</td>
<td>26</td>
<td>9</td>
</tr>
<tr>
<td>9 Examinations being too rigid.</td>
<td>49</td>
<td>37</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 3  A comparison between rural and urban schools regarding nature of problems
Apart from drawing comparisons between rural and urban schools regarding the nature of problems, Table 3 also shows that only 4 problems were critical across the board, namely:

- Shortage of relevant literature.
- Lack of variety on teaching aids.
- Negative attitudes on the part of fellow teachers and school heads.
- Rigid examination systems.

These were the 4 major problems out of the 9 that had been cited. In terms of magnitude, these 4 appeared significant in both rural and urban schools. However, highlighting these 4 does not mean the other 5 problems were not important. It is only that those 5 were associated more with either urban or rural schools, hence the need to draw comparisons in order not to miss those interesting patterns as reflected in table 3.

4 Discussion and conclusions

This discussion is centred on the findings of study, especially those relating to the identification of problems. Another aspect of interest is going to be on the comparisons between rural and urban schools on the nature of problems.

i) Shortage of relevant literature

One of the most important skills in design and technology is the ability to engage in research activities where the learner is expected to investigate for possible solutions to a given problem. For example, this is where after being given an assignment, pupils would visit libraries looking for information. Now, if there are critical shortages of literature, as was the case in this study, one is likely to experience problems of implementation as far as design and technology is concerned.

This problem is not unique to Zimbabwe. Ogunniyi (1986) maintains that, it is important to note that in the developed world the inadequacy and shortcomings of texts is judged on the basis of many and diverse texts, yet in African Systems texts are a scarce resource. Therefore, because of this scarcity, teachers and their students fail to benefit from diversity of perspectives, experiences, philosophical orientations and epistemological leanings of various authors (Ogunniyi, 1986). And given this situation, it is conjectured that distortion of the design and technology approach due to a lack of multiple-view-points is most likely to be prevalent.

ii) Lack of variety on teaching aids

The experience in most schools was that the chalkboard was the main teaching aid. This was a negation of the principles of design and technology. Being progressive, design and technology requires the use of a wide range of teaching aids, among which one would consider gadgets like; overhead projectors, slide projectors, film projectors, video recorders and television sets. According to Ogunniyi (1986), this would give pupils a broader outlook of the world.

iii) Negative attitudes on the part of fellow teachers and school heads

This problem was reported in both rural and urban schools and it is suspected to be a legacy of our colonial past. According to Zvobgo (1986), during the colonial era, technical subjects were considered inferior to academic subjects like History and English. Hence, they were recommended for pupils considered less intelligent. From there, the subjects developed a strong stigma and today there are still some school heads who do not think it is worthwhile spending money on these subjects, especially now, given economic hardships in the country.

iv) Rigid examination systems

All teachers in this study complained about this problem. They alleged that examiners did very little, if anything to encourage use of locally available materials in problem-solving. Instead, they encouraged the importation of materials from elsewhere, especially out of the country, which proved very expensive. These allegation had implications on curriculum development. One wondered whether there was adequate co-ordination of activities between curriculum developers, teachers and examiners.

v) Other interesting observations on the findings

Although one expected the shortages of equipment and materials to be critical, given
the economic hardships the country is currently undergoing, the surprise was that the situation was not that serious. This was probably because teachers had been taught to improvise wherever possible. In other words, after attending university, teachers became more resourceful. Perhaps, this is why they all complained about examination systems being too rigid. By not acknowledging use of locally available materials examiners appeared not to recognise the importance of teachers being resourceful and creative. Where shortages were involved, for example literature, materials, equipment and teaching aids, rural schools appeared more disadvantaged than urban schools. This raised questions about the issue of ‘equality of educational opportunity as equal right to education for everyone’. According to Akinpelu (1995) this is an issue where debate continues all over the world, especially in developing countries.

5 Recommendations and suggestions
In view of the problems discussed, there appears to be need for further research. More information is required if some of the problems are going to be addressed at national level. For example, further research could help to determine the following:
• The extent to which the shortage of resources like literature and teaching aids could be affecting the performance of pupils, in work relating to design and technology.
• Ways of improving the image of Technical Education in Zimbabwe, especially with a bias towards design and technology.
• The mechanisms that could be used to improve the lines of communication between the Curriculum Development Unit, teachers and examiners on issues relating to assessment strategies.
• And, lastly but not least, the extent to which the subject of ‘values’ has been addressed in relationship to design and technology in the Zimbabwean context.

References
• Barrow, R. (1984), Giving teaching back to teachers - a critical introduction to curriculum theory, Wheatheaf, Sussex.