Investigating Learning by Teaching and Learning by Assessment

Moseli A. Mafa
Lesotho College of Education,
moseli3712@gmail.com

ABSTRACT

This report outlines research on action, using my living educational methodology, in which I expose three groups of science student-teachers (as learners) to both learning-by-teaching and learning-by-assessment strategies. Throughout this period, I use field notes, lesson observations, and learners’ questionnaire responses to record, code and qualitatively analyse data and establish the extent to which these strategies are able to enhance learning; to show how I can improve. The study reveals when the strategies result in deepened understanding, higher motivation and increased skills for further learning; though quite cumbersome to learners if content-based curriculum is followed. It also indicates that the tutor should give precise and accurate timely guidance to avoid any possible misconceptions.

Background

Learning-by-teaching is a method where students learn as they teach each other. This can be done by forming groups consisting of about 3-5 students. Each group is allocated some concepts to research on, discuss among members and decide on the strategies to use for teaching the concepts to the rest of the class (Martin, 2008; Skinner, 2006).

Learning by teaching proponents argue that it is highly centred and augurs well with the advocates of collaborative and cooperative learning, including social constructivist theories (Van Aswegen, Fraser, Nortje, Slabbert, Kaske, 1993; Wenger, 1998; Mitchell and Sackney, 2000). The contention here is that in these group discussions, students are able construct knowledge together and come to a shared meaning of these concepts, in ways that are more conducive and permissive. On the one hand, allowing students to assume the teaching role is deemed to allow learners’ prior knowledge to promote and nurture meaningful and effective learning (Deer and Wolfe, 2001). In turn this can be a source of motivation to learn (Shor and Freire, 1987). Consequently, it can encourage ‘lifelong learning, where the whole of the society becomes a learning resource for each individual’ (Aspin, 2000:2, citing Corpley 1979a:105).

In this study, I largely use the Learning-by-teaching strategy, but in addition utilise the principles of students’ holistic assessment for improvement of learning (Khaahloë & Makamane, 2010). I call this learning-by-assessment. Accordingly, assessment techniques should be varied, enabling and appropriate; covering not only learner’s understanding but also the acquired process-skills, attitudes and competences. I also partly used the principle of problem solving method where students are given assessment task that were previously not taught; so that they research and teach themselves to answer these question. In all cases of the assessment, feedback is then given and used for learning improvement (Khaahloë & Makamane, 2010).

METHODOLOGY

In this study I reflected on my action of using both learning-by-teaching and learning-by-assessment strategies, (Schon, 1987; Hopkins, 2002). A ‘living educational theory’ method was used (Whitehead, 1989) in order to improve my practice as a lecturer. I do this by observing three groups of student-teachers, through-out their three different semester courses and thereby taking some field notes from these lessons. Learners’ end-of-course evaluation responses were used to reflect-on practice. I also used snow-ball open-ended interviews with
one of these groups, to get their experiences and perceptions on learning by teaching pedagogy. The interviews were tape-recorded and then transcribed into written responses (Maykurt & Morehouse, 1994).

Constructs from lesson observations, course evaluation and interview responses were coded and analysed qualitatively to interpret their meanings into conclusions (Maykurt & Morehouse, 1994). The overall performance of the students’ assessment at the end of each course was also used in drawing conclusions.

Participants
As it is the case with every action research, all students were involved in the classes (groups) who used the strategies (Dick, 1997).

The first group consisted of eight prospective biology teachers, in their third and final semester at the college. The second group consisted of 22 prospective secondary biology teachers, who were in their second semester of their first year of study. The third group were nine prospective secondary science teacher-trainees, in their first semester of their final year of study.

RESULTS & ANALYSIS

<table>
<thead>
<tr>
<th>Findings</th>
<th>Evidence and explanations</th>
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| Needs more time and resources availability.   | One student remarked ‘this method is 
|                                               | time consuming...’. Most learners were of the view that the strategies demanded more of their time and needed more books, internet availability, for researching and answering the many pieces of assessment. |
| Increased motivation & non-obstructive learning climate. | Observations showing useful debate and excitement among students. As one student observed: I enjoyed the way we teach each other, discuss the concepts... ‘Another said: ‘the method is very motivating’... |
| Boosted self-directed & lifelong learning skills. | Observation that two students expelled from the lessons in the last three weeks of the course, ended up getting the highest score in the final examination. Probably as a result of acquired self-study skills leading to better motivation to learn on their own. |
| Improved communication skills                 | One student observed: ‘I have learned things like communicating well with my group members, to put information that I had gathered logically...’ ‘Another noted: ‘it has also improved my questioning skills...’ |
| Challenging, but leads to higher level of thinking. | As one student commented: ‘when searching the internet we do not know how deep we must research’. Another said ‘It needs people who are hard workers, who are able to think widely and come up with sound and brief answers resulting in high level of thinking’ |
| Deepens conceptual understanding; higher performance obtained. | One student noted ‘I was able to get better understanding.’, while another realised: ‘everything we had done was not easily forgettable.’ Student’s end of courses performance was also notably high (see appendix II). |
| Needs more time to be mastered.               | As one learners noted ‘it took time for me to adjust and adapt to this way of learning’, another observed ‘it was quite hectic at first before I adapted...it |
became better with time’. Perhaps the reason why the group of students who were in their second semester of their third year of study performed so well compared to the other two groups (Appendix II)

| Increased interest and the urge to learn more. | ‘It is also develops interest of students to learn further because if there are arguments during the delivery of the content it will pressure students to take unresolved issues for further research...’ noted one student. |
| Demandng and may brings poor relationships. | Observations of the emotions of anger for being over-burdened as a result of the research and time demands of the strategies. A student commented, “this would bring conflicts among group members...also one who is not sure about answers becomes angry to questions that are asked...” |
| Boosted self-confidence. | Students questionnaire responses showed when the strategies resulted in significantly higher confidence among them. One student realised: ‘...that motivated and made me to be more confident...’ |
| May lead to confusion and misconception. | ‘Some other groups would be disorganised and that leads to confusion’. The lecturer has to emphasize the main points to avoid misunderstanding confusion and misconceptions’. |
| Favours skills-based, rather than content-inclined Curriculum. | One learner noted that: ‘We covered a lot of topics and content within a short time’. Another student commented that: ‘more time is spent on a few concepts. Thus it is difficult to cover content in the expected time. |
| Needs tutor to give timely guidance and corrective feedback. | One learner commented: ‘sometimes the lecturer do not pin-point the misconceptions...’ another argued that ‘...the lecturer should guide the students, how deep they should research’ |

CONCLUSIONS

Most students perceived these strategies to have been quite useful in encouraging self-directed, life-long learning skills as well as deepening the level of understanding on specific concepts. In many cases students felt the method to be interesting, challenging and demanding in terms of resources and time devoted for researching and answering to the various assessment items given. In some cases students felt they wasted a lot of time due to the urge to want to know more on certain concepts.

There were cases where the combined strategies gave rise to frustrations and anger, mainly because of the burden of work on the shoulders of students. This burden was aggravated by the highly content-based curriculum, as opposed to the skills-based curriculum that seem to augur well with the strategies. However, student-friendly, seamless and non-obstructive learning climate established through the strategies was unquestionable. Thus, despite needing more time, resources and tutor guidance, the strategies were found quite successful in raising the motivation, depth and level of achievement in term of short term and long term benefits to students. The sample of learners studied was very small, therefore there is more researched work needed on this regard.

Some of the student-teacher who experienced learning by teaching and learning by assessment
REFERENCES


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### APPENDIX I

**Learners’ Course Evaluation**

Course Name ________________________ Course code________________

Course Tutor_________________________ Year________________

1. The given Course Outline
   A) provided very little information
   B) was too crowded and confusing
   C) gave enough information
   D) had relevant and useful information
   E) other (give)..........................

2. The delivery (methods of teaching/learning) of the course was
   A) dull
   B) fair
   C) good
   D) excellent
   E) other (give).........................

3. The teaching resources/materials used were
   A) very poor
4. The groups’ work organisation and activities were
   A) poor
   B) wasteful
   C) useful
   D) highly beneficial
   E) other (give).............................

5. The practical work during the course were
   A) very poor
   B) lousy
   C) appropriate
   D) highly motivating
   E) other (give).............................

6. The means of assessment (practical reports, assign., tests) were
   A) cumbersome
   B) inappropriate
   C) well pitched
   D) at the right level
   E) other (give).............................

7. Marking of work given was
   A) too strict
   B) biased
   C) fair
   D) very good
   E) other (give).............................

8. The course content was
   A) too much
   B) too little
   C) Appropriate
   D) Well balanced
   E) Other (give).............................

9. The time allocation for the delivery of the course was
   A) very poor
   B) Inadequate
   C) Appropriate
   D) Well done
   E) Other (give).............................

10. The course was generally organised
    A) haphazardly
    B) inconsistently
    C) fairly well
    D) properly and logically
E) other (give)……………………………………

11. In general, the course was found to be
   A) irrelevant
   B) hardly useful
   C) enlightening
   D) highly informative
   E) other (give)……………………………………

12. Give any additional information in the lines below:
   __________________________________________________________________________
   __________________________________________________________________________
   __________________________________________________________________________

APPENDIX II : END OF COURSE ASSESSMENT PERFORMANCE OF STUDENTS

<table>
<thead>
<tr>
<th>Groups exposed to the two learning strategies</th>
<th>Total no. of students</th>
<th>No. of A Passes (≥80%)</th>
<th>No. of B passes (70-79%)</th>
<th>No. of C passes (60-69%)</th>
<th>No. of D passes (50-59%)</th>
<th>No. of failures (&lt;50%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>8</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Group B</td>
<td>22</td>
<td>0</td>
<td>7</td>
<td>9</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>Group C</td>
<td>9</td>
<td>0</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
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APPENDIX III : Tentative Interview Questions

1. In your first year you studied using learning by teaching method, what can you say about the method?
2. Is learning by teaching helping students or even teachers? Discuss.
3. What things can help learning by teaching to (or not ) be successful?
4. What are advantages and/or disadvantages of learning by teaching method?
5. How did the method of learning affect you in your studies as a whole? Explain your answer.
6. At what level should the learning-by-teaching method be used? Elaborate on your answer.
7. What are any other general comments and recommendation do you have on learning-by-teaching method?

Student-teachers in discussion, during learning by teaching method