

Research Article

Science teacher mentors' perceptions of actual and preferred school conditions for mentoring student teachers to effectively use learning technology

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ABSTRACT

In Zimbabwe teachers' colleges diploma in science education student teachers go for Attachment Teaching Practice (ATP) in the second year of the three year diploma. Among others during ATP, science teacher mentors assist student teachers to develop skills in using instruction anchored on learning technology. This study sought to find out the nature of science teacher mentors' perceptions of actual and preferred school conditions involved in mentoring student teachers to effectively use learning technology. A questionnaire was used to collect both qualitative and quantitative data. Results indicate that school conditions like high workload, large classes, congested timetables, lack of learning/teaching resources and nature of appraisal system, reduce effectiveness, of mentoring, hence compromising the quality of science teacher preparation. The potential of science teacher mentors could be enhanced by creating an enabling work environment, through meeting mentor needs.

Keywords: teacher mentors; ATP; actual school conditions; preferred school conditions;

1. INTRODUCTION

Technology is having an impact in modern life, as evidenced among others, by computers controlling telephone routing, car engines, deciding in washing machines when dishes and clothes are clean. Koç (2005). This justifies full integration of technology into educational settings to support development by learners of higher order skills, collaboration and ability to disseminate information. Dewey (1916) argues that teaching today as we taught yesterday, disadvantages learners tomorrow. Therefore, teaching and learning should prepare learners for 21st century skills and beyond. This implies that teacher preparation programmes should assist prospective teachers develop knowledge and skills to use instruction anchored on learning technology. Learning technology include use of ICT like computer hardware/software, audio devices, videos, other multimedia tools (Arnold, Padilla and Tunhikorn (2009), and the worldwide web, to enhance teaching, learning and assessment (Gökçearsan, Kafdemir, and Korucu, 2017). When used appropriately, learning technology can enhance learning and deepen student understanding of complex science concepts, as well as developing knowledge and skills to apply technology in life (Türkmen, 2007). Teachers well prepared in ICT use can facilitate success of technology based teaching and learning (Rosdy and Ghavifekr, 2015).

Many stakeholders including politicians have echoed the need to make technology an integral component of teaching and learning (Cantu, 2000). Therefore, it is important that beginning science teachers have relevant knowledge, attitudes and skills for effective use of learning technology in learner-centred instruction. Science student teachers as prospective teachers, get first practical experience of teaching in a real classroom setup during attachment teaching practice (ATP). ATP is a stage during science teacher preparation when a student science teacher works under a qualified science teacher called a mentor (Austin, 2018), to develop knowledge, skills and attitudes to enable them apply learning technology appropriately (Koç, 2005). ATP is critical to science teacher preparation, since it initiates the novice entrants to use of appropriate learning technology in the science teaching profession. Becoming a science teacher is a challenging task, because the novices have to develop knowledge and skills, necessary to impact pupils' learning, through appropriate use of learning technology (Schneider, 2008). If mentoring is not done properly, there is a risk that prospective teachers may acquire knowledge, skills and attitudes which are not appropriate for instruction with learning technology as its anchor (Arnold and Padilla, 2009). In science teacher preparation, ATP is based on the idea that science student teachers are attached to experienced science teachers called mentors. Mentoring focuses on the needs of science student teachers to develop requisite knowledge and skills for the teaching profession (Payne, 2018). Mentors also give the novices support they need to be successful in their roles (Baran, Bilici, Sari, and Tondeur (2019). The selection of mentors is based on teaching experience. Mtetwa, Chipangura, Kwari and Makamure (2002) argue that anyone with sufficient work experience has a potential to be a mentor. However, Schneider (2008) observes that experience and expertise alone cannot ensure

that the teacher will know how to effectively mentor the novice teacher. Therefore, mentors need structured educational guidelines (Garza et al, 2019), that are based on learning technology competences teachers should acquire, what mentors need to know about assisting mentees to effectively apply learning technology in instruction, and what role mentors should play in preparing student teachers, to develop competences in applying learning technology. The characteristics of an effective mentor are cited in Mtetwa et al (2002). These are: (a) willingness to share knowledge, skills, material resources and experiences, (b) ability to welcome new comers and show interest in them, (c) supportive, challenging, patient and enthusiastic as they guide others to new level of competence, (d) have more expert knowledge, but view themselves as equal to those they mentor, and (e) mentors are themselves visible learners. A critical analysis of the role and qualities of an effective mentor shows that ATP has potential to imbue the student teacher, with relevant motivation, knowledge, skills and attitudes relevant for effective use of learning technology in the teaching profession (Hudson and Hudson, 2010). While student teachers cannot know everything above learning technology, they should have skills to guide and coach with confidence in technology skills to let learners explore with technology (US Department of Education, 2016). Tobin in Fraser and Walberg (1995) observes that change in a school system occurs when teachers perceive the school climate to be conducive to the change. Therefore, school conditions and attendant science teacher mentors perceptions have potential to influence how science student teachers are mentored.

There is evidence from literature which suggests that school conditions influence how teachers organize learning. Engels (1993) and Hord (2000) concur that a fully competent teacher may perform less than adequate in the classroom if she/he is working in a disorganized and unsupportive environment of teaching and learning. On the other hand, a teacher with only minimal competence may satisfactorily apply learning technology given supportive favourable conditions. Aston and Web in Sergiovanni and Sarrati (1993) found that a supportive school climate contributes to teacher efficacy. School conditions refer to the tone, atmosphere and organizational structure of a school (Chakanyuka, 1996). Ota (1995) found that academically effective schools are distinguished by their unique culture and conditions of values and norms that channel both teachers and students in the direction of successful learning and teaching. A climate like this provides teachers with the opportunity to create what they value most, for a productive learning relationship with their students

An environment in which supportive and humanistic policies are applied gives teachers emotional support (Hudson, Usak, and Savran Gencer, 2009). This environment promotes professional growth of teachers in the application of ideas and learning technology. Such a supportive environment encourages risk taking as teachers have high degree of experimenting and innovating without fear of retribution, ridicule or other types of punishment (Chakanyuka, 1996). In addition, such environment determines what teachers do, how they relate to each other, the quality of student achievement, and other gains the school may achieve. In their study, Fullan and Hargress (1991) found that teachers were entirely aware that their jobs had become immensely big. The diverse and ever-changing ethnic composition of classrooms, unstable home and community conditions from all social classes, poverty and hunger together with the need for accountability, were attributed to increased sense of pressure among teachers. Fullan and Hargress (1991) argue further that time is an important resource which may bolster or block innovation. Time to plan with colleagues, to observe someone else's teaching, peer coaching and time to work with individual students, can improve the quality of teachers' work (Gut et al, 2014). Bowora and Mpofo (1995) argue that the teacher who believes that he or she is not receiving a fair share of school resources often becomes antagonistic towards other teachers. This conflict may result in withholding of information and disruptive behaviour.

Examinations are a school condition which has potential to adversely affect mentoring. In many educational institutions, high stakes examinations are a means of assessing progress as well as selecting students for university studies. Tobin (1993) found that society places virtually exclusive emphasis on test and examination scores (Nurcan and Mustafa, 2015). This emphasis results in students ignoring the process of learning, becoming interested in test or examination scores. Such emphasis on examinations by society may cause the teacher to implement any strategy/learning technology which contributes to the achievement of high pass rate. This concurs with Mushayikwa (2000) who argues that teachers know the most effective methods of learning, including learning technology, but application is weighed against society's expectations. Also, Fullan and Hargress (1991) argue that imposing punitive appraisal schemes that implicate 100% of the staff in order to detect a small percentage of incompetence is a gross waste of time. Ironically, the anxiety generated by the punitive appraisal schemes can hold back skills of many teachers as they become reluctant to take risks for fear of retribution. Like any other syllabus, science syllabuses have specific aims and objectives, which should be achieved within a specific period. In other words, aims and objectives are time framed. Hargreaves and Earl (1990) in Fullan and Hargress (1991), argue that such closely prescribed context-laden guidelines tend to lead teachers to concentrate on coverage that is "getting through" the material. They further argue that emphasis on "coverage" in turn leads to learning/teaching methods which run few risks of missing the facts (Nurcan and Mustafa, 2015). Tobin (1993) also notes that the science teacher is sometimes in a dilemma, because the concern for understanding competes with concern for covering the syllabus and testing what has been covered. Such a dilemma may force the teacher to implement strategies regarded as taboo, usually avoiding using learning technology.

The National Council for Teacher Education (NCTE) (2009) observes that teacher quality is a function of many factors like teachers' status, remuneration, conditions of work, teachers' academic and professional education, among others. Therefore, the most important aim of teacher education programmes should be to empower student teachers to be responsible, and be able to learn from every opportunity throughout their lives. Aydin and Kecik (2011) argue that teaching practice (TP) in most school-college/university partnerships have demonstrated problems related to organizing and monitoring. Criticism has been focused on failure to establish equal partnership between the school teacher (practitioners) and college/university supervisors (academics). Such a relationship has potential to affect mentoring.

In Zimbabwe, the responsibility of preparing prospective teachers in the Diploma in Education programme is shared by two government ministries. These are, the Ministry of Primary and Secondary Education (MoPSE) for primary and

secondary education, and the Ministry of Higher and Tertiary Education, Science and Technology Development (MHTESTD) which deals with education in colleges (Educational and Vocational), Polytechnical colleges and universities. For preparation of science teachers, Teachers' Colleges provide the student teachers with subject matter and professional theory courses during the residential period. For ATP, MoPSE provides schools and science mentors. Teachers' College M is an associate college of the University of Zimbabwe (UZ). Science student teachers at Teachers' College M go for ATP in the second year of their three-year Diploma in Education course. The science student teachers work under the guidance of science teacher mentors. Therefore, science teacher mentors have a pivotal role they play in Teachers' College M science teacher preparation.

Interaction of school conditions must create an enabling environment, for science teacher mentors to carry out their duties effectively. Engels (1993) argues that conditions under which science teacher mentors work determine the quality of mentorship. Tobin in Fraser and Walberg (1995) argues that even if teachers know what needs to be done, and have personal commitment, but they can still resist implementing change, unless they (teachers) perceive the school conditions as conducive to the change. Premised on this, science teacher mentors' perceptions of school conditions are likely to have a significant impact on how they mentor science student teachers on ATP. Therefore, there is need to collect and analyze data on science teacher mentors' perceptions of the actual and their preferred school conditions involved in mentoring, and how they (mentors' perceptions) influence assistance mentors give to science student teachers to develop competences to use instruction with learning technology as its anchor.

2. RESEARCH METHOD

In this comparative study 60 science teacher mentors were purposively sampled from Manicaland and Masvingo Provinces of Zimbabwe, in which Teachers' College M deploys science student teachers for ATP. Purposive sampling was relevant because respondents were expected to provide specific data which could not be obtained from science teachers not involved in mentoring. The teachers sampled were either current science teacher mentors or those who had mentored Teachers' College M science student teachers on ATP before. The sample comprised mentors at day government, mission, boarding, day-urban and day-rural secondary schools. Therefore, there was a broad representation by the sample of science teacher mentors under various school conditions.

A questionnaire was used to collect data. Best and Kahn (1993) report choosing good items and difficulty of wording the questionnaire clearly, as some of the challenges faced in constructing a good questionnaire. In order to minimize these challenges, the format of an instrument called the School Laboratory Environment Inventory (SLEI) (Fraser, 1995), was used as a scheme to construct the instrument for this study, which is called the School Climate Conditions Inventory (SCCI). The SLEI has been previously tested in a number of countries, and its reliability and validity have been proved to be relatively high, (Tambo, 2000). In addition, the SLEI format has proved to be short and economical in terms of administration and scoring, while at the same time it gathers data for various dimensions. It is for these reasons that the SLEI was chosen as the scheme for the SCCI. The School Conditions Inventory (SCCI), comprised two forms, which are the actual and preferred forms. Each form comprised two sections, one which generated quantitative data, and the other qualitative data. The questionnaire was distributed physically by the researcher and colleagues during Teachers' College M ATP internal supervision visits to schools in Manicaland and Masvingo provinces. Questionnaire copies were collected soon after they were completed. Out of 60, 51 completed usable questionnaires were returned. Quantitative data was converted to percentages, analyzed and interpreted. Qualitative data from questionnaires was used to qualify quantitative data interpretation.

3. RESULTS AND DISCUSSION

Findings from the study are presented in tables and verbatim, with analysis and interpretation to provide answers to the research problem done under the themes:

- a) Workload;
- b) Results Based Management;
- c) Learning Resources;
- d) Emphasis on Examinations; and
- e) Support for Science Education Teacher Mentors and Student Teachers.

a. Questionnaire Data Presentation Tables 1 & 2

Table1. Percentage responses on actual school conditions during mentoring

| Actual School Condition | Total for Yes | % | Total for No | % |
|--|---------------|-----|--------------|-----|
| Workload is high | 43 | 84 | 8 | 16 |
| Results based management (RBM) is linked with salaries | 35 | 69 | 16 | 31 |
| Emphasis is placed by school and society on high examination pass rate | 45 | 89 | 6 | 11 |
| Support from the school for science teacher mentors is low | 49 | 96 | 2 | 4 |
| Support from Teachers' College M for mentors low | 38 | 75 | 13 | 25 |
| Science student teachers are supplied with learning aids by schools | 4 | 8 | 47 | 92 |
| Science teacher mentors are recognized by MoESAC | 0 | 0 | 51 | 100 |
| Science teacher mentors have a role to play in pre-service science teacher education | 51 | 100 | 0 | 0 |

Table 2. Percentage responses on preferred school conditions for mentoring

| Preferred school condition | Total for Yes | % | Total for No | % |
|---|---------------|-----|--------------|----|
| Workload to be increased | 7 | 14 | 44 | 86 |
| RBM to linked with salaries | 15 | 29 | 36 | 71 |
| Increased learning aids | 46 | 92 | 4 | 8 |
| Less emphasis placed on examinations | 45 | 88 | 6 | 12 |
| Amount of written work pupils should write and be marked by the teacher should be decreased | 42 | 82 | 9 | 18 |
| Teachers' College M support for mentors should increase | 49 | 96 | 2 | 4 |
| MoESAC should recognize mentors | 51 | 100 | 0 | 0 |

b. Workload

Table 1 above shows that majority of respondents (84%) acknowledged that their workloads were high. Reasons given were large teaching loads, large class sizes and extra duties. Large classes implied that science teacher mentors had to struggle with marking large amounts of written work by pupils. Comparing the percentage (84%) on the actual school conditions for mentoring, with the percentage (16%) of mentors who preferred their workload to be increased, there is a huge difference of 68%. This shows that most mentors preferred workload to be reduced. Mentors indicated that reducing their workload would give them more time for the demanding task of developing skills of mentees in appropriately using learning technology in instruction, hence improving the quality of mentoring.

When asked the nature of teaching load preferred to enable them assist science student teachers to use learning technology in instruction science teacher mentor T said:

While there is no prescription on teaching load mentoring should be given time so that I can fully assist student teachers to develop expected competences to use learning technology. Time for me and student teacher to plan and discuss pertinent issues is needed, so that intended teaching practice objectives are achieved.

Mentor T's response shows that appropriate workload and time are important factors in development of the expected learning technology skills in science student teachers. Also science teacher mentor T's response corroborates the questionnaire response by 86% of science teacher mentors who indicated that reducing their workload would give them more time to assist their mentees, hence improve the quality of mentoring. This suggests that a balance should be made between a science teacher mentor's school duties, and the mentoring responsibilities, so that science student teachers are fully supported in developing competences to use learning technology anchored instruction.

c. Results Based Management

Majority (82%) of science teacher mentors perceived the policy on pupils' written work, which they were supposed to mark and record as demanding too much. Science teacher mentors acknowledged the need for pupils to be given written work which should be marked and recorded for monitoring and evaluation purposes. Most of the mentors interpreted linking rewards like salary increase and bonuses to unfavourable conditions like high workloads, as punitive. They indicated that this tended to generate tension in mentors, between assisting science student teachers on ATP in developing hands on approaches, with learning technology, which demand commitment in terms of time to plan and prepare, and meeting highly pitched standards of results based management (RBM), compared with the context characterised by large classes, lack of learning resources and poor remuneration.

Commenting on demands on written work science teacher mentor V said:

There is too much emphasis on written work pupils should be given and which the teacher should mark and record as evidence that learning has taken place. What is not considered is that classes of 60 pupils on average are too large. Giving a lot of written work the teacher should mark to 5 classes of that size mean that the teacher will concentrate on giving written work without focusing on achievement of teaching and learning objectives. The teacher with such a load and now a mentor, will not do mentoring duties as expected because of pressure of work.

Another science teacher mentor K commented saying:

Linking pay increase to performance when demands on the teacher are unrealistic is not fare. This may force teachers to do poor quality work in an attempt to avoid losing rewards. As for mentoring, a teacher working in such an environment will not put the required effort, so as a result student teachers will be left without support which is not good.

Responses by science teacher mentors V and K show that unfavourable working conditions for science teacher mentors negatively affect the quality of science student teachers' attachment teaching practice experience, in using learning technology due to lack of support from mentors. In order to address this, Teachers' College M, and probably other teachers colleges where similar problems exist, should put effort to make policy makers in the Ministry of Primary and Secondary Education (MoPSE) aware of the need to engender policies which compliment the preparation of high quality teachers through good ATP experiences.

d. Learning Resources

While resources are considered important for effective learning, majority (90%) of the science teacher mentors indicated that apparatus for most practical activities were not available, resulting in class demonstration as the dominant approach. The student book ratio was perceived to be too high which made it difficult for each pupil to use textbooks individually. All science teacher mentors indicated that lack of learning resources, was a challenge in schools. It is therefore critical to match class size and available learning resources for successful mentoring. This would, according to mentors, enable them to assist student teachers develop skills to use hands on approaches which promote use of learning technology in learning of pupils. As a way of mitigating the challenge of lack of learning resources/learning technology science teacher mentor K said:

Improvising is an alternative to reduce the negative effects of lack of learning resources. However, teaching loads should be low to create time to improvise and pre-test material to see whether it is functional before the lesson.

From science teacher mentor K's response, science teachers acknowledge the existence of challenges in teaching and learning of science, and are willing to mitigate the challenges. Provision of an enabling working environment is what science teacher mentor K raised as the most important preferred condition for science teacher mentors to assist science student teachers to improvise learning technology. Developing such skills in science student teachers is critically important, because it makes them good beginners when they join the teaching profession after qualifying especially in developing countries like Zimbabwe, where learning technology lacks.

e. Emphasis on Examinations

Findings show that science teachers put too much emphasis on high pass rates on O-level and A-level examination grades. The reason for this being negative perception of teachers who produced low pass rates by both schools and society. This, according to science teacher mentors, caused high commitment to teach for high examination pass rate, by whatever strategies. In line with this view science teacher mentor N said:

Emphasis on examination high passes is exhibited by labels attached to teachers who produce low pass rates. Mentors tend to coach student teachers in drilling students for examinations at the expense of skills to use learning technology, and assisting pupils in all round development consistent with the Unhu/Ubuntu philosophy.

From mentor N's response it can be deduced that science student teachers do not get the support they need for developing knowledge, skills and attitudes for appropriate use of learning technology in instruction. Therefore, science student teachers are left to do unguided discovery on what works, and what does not. This may result in them developing skills not consistent with science education goals.

f. Support for Science Teacher Mentors and Science Student Teachers

Majority (96%) of the Science teacher mentors indicated that support from schools was low. Mentors acknowledged that in some cases they were entirely aware of what should be done, but lack of learning / teaching aids, for hands-on approaches, restricted their level of mentoring. The seriousness of lack of learning aids is reflected by a high percentage (92%) of science teacher mentors, who acknowledged the shortage of learning aids. The level of awareness by science teacher mentors of their roles in pre-service science teacher preparation was very high (100%). These mentors indicated that they preferred support for science teacher mentors to increase. Qualitative data from questionnaires suggested that Teachers' College M facilitated workshops for science teacher mentors, school heads, MoPSE officials, could develop a common understanding, which would improve science teacher mentors' performance, hence the quality of teacher education. Also all science teacher mentors who participated in the study noted with concern the lack of recognition of mentorship as part of their core duties. They indicated that lack of recognition caused them to be overloaded with work, which adversely affected mentoring. Also, 100% of the mentors suggested that MoPSE should establish a reward system, so that commitment may improve.

Mentor F said:

Our ministry MoPSE does not recognize mentoring as official post of special responsibility. With the high demands placed on the mentor during mentoring, surely some form of reward is necessary to motivate mentors to commit themselves.

Mentor D lamented lack of laboratories in schools saying:

Improvisation has limits. There are certain practicals for which improvisation does not work. MoPSE should put effort to build laboratories in schools so that practicals and experiments are done. Without practicals it is difficult for mentors to assist student teacher on how to help pupils develop correct science concepts.

The support mentors need should be in form of "incentives" (Mentor F) and teaching and "learning materials" (Mentor D). Responses by these mentors show that necessary support should be provided to mentors if they are to perform as expected. It is important therefore for MoPSE to support science teacher mentors during ATP in developing knowledge, skills and attitudes of science student teachers in using instruction anchored on learning technology.

4. CONCLUSION

Pre-service Science teacher education preparation is a shared responsibility between MHTESTD (Teachers' College M) and MoPSE (schools and Education officers). However, it seems these stakeholders are not aware of the need to collaborate effectively, to produce high quality science teachers. Schools take ATP and mentoring as Teachers' College M (MHTESTD) business. Ironically, qualified science teachers get employed mostly in MoPSE. If the teachers are of poor quality in terms of using learning technology, due to poor pre-service preparation, the effect of poor pupil performance will be felt immediately in secondary schools (MoPSE), yet the very same schools did not play their role of mentoring during pre-service preparation. Chances will be very high, that the deficiencies in using learning technology by science teachers will have a ripple effect of adversely affecting pupil performance. This in turn, will affect the socio-economic development of Zimbabwe as a nation, as school graduates with deficiencies enter the job market, to join the education, economic, commercial and other sectors of the economy. It becomes a vicious cycle. Poor performance in education has far reaching impact which has potential to adversely affect sustainable development. Therefore, due attention should be given as explained by findings of this study.

AUTHOR'S CONTRIBUTIONS

The author considered the design and analysis, collected the data, performed the analysis, and wrote the paper.

CONFLICT OF INTEREST

The authors have no conflicting interests of any kind in the submission of this research paper.

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