



The Impact of Chemistry School Radio Broadcast in Secondary Schools in Vihiga County, Western, Kenya

Abuli, Wellington, Florence Odera
Bondo University College

ABSTRACT

School radio broadcast were introduced in education in the 1920's in the developed countries as a strategy to reinforce teaching and learning. In the 1960's school radio were introduced in Kenya with the aim of improving quality of education, widening access to education, training of teachers at lower costs and diffusing superior teaching methods to serving teachers. Despite the existing of radio broadcasts to schools for more than three decades there is no documented information on whether the schools in Vihiga are using the broadcasts in teaching and learning science. The purpose of this study was to determine the extent of utilization of the schools broadcasts in Vihiga County secondary schools in teaching and learning science. The main objective of the study was to find out the impact and the factors influencing the use of the schools broadcasts in teaching and learning science in Vihiga County secondary schools. He study used a descriptive survey design conducted in 20 secondary schools in Vihiga County. The participants included 20 head hers, 60 science teachers and 1000 form three students.data was collected using structured interview schedule for head teachers, questionnaires for the science teachers and their students, and an observation schedule in all the sample schools. Cluster sampling technique was used for selecting schools and the head teachers. Purposive sampling was also used to select the form 3 science (chemistry, physics and biology) teachers data analysis involved the use of descriptive statistics combining both qualitative and quantitative methods. The findings of the study will be of significance in that it may contribute to new knowledge on the use of science radio broadcasts in secondary schools that will help in the improvement of the design, management and evaluation of the programmes in Kenya and will also be useful for future research in educational radio broadcasting.

Keywords: *science, school radio broadcast, Vihiga County, Chemistry, utilization*

I. INTRODUCTION

This study is about the use of radio for instructional purposes in the teaching and learning science in secondary schools in Vihiga County. The invention of radio, though normally credited to the Italian Guglielmo Marconi, was a process in which many scientists made their contributions. These included James Clark Maxwell (the mathematician who populated the existence of electromagnetic radio waves), Lee Deforest (who invented the vacuum tube diode and triode, devices for detecting and amplifying radio waves respectively), Canadian Fessenden (who invented the supereterodyne principle in radio technology), and the American Armstrong (who invented FM radio) among others. The technology of early radio was cumbersome, but decades of improvements have produced far more efficient systems than even the early inventors would have imagined. The uses to which radio has been put are also diverse, though most people are more familiar with commercial radio, which Repath (1966) called "The Constant companion." However, history has it that early radio was mainly educational (Dominick, 2005).

Early radio broadcasting in the 1920's which was mainly done by electronic companies, like Westinghouse and AT&T in the USA, and educational institutions, was inexpensive. These broadcasters figured they got their money's worth through the exposure they received through broadcasts. Soon, however, the operating expenses became high and the electronics companies invited advertisers to sponsor

their broadcasts at a fee. In turn the advertisers demanded for large audiences, a problem which the broadcaster solved by reducing the educational content for their broadcasts and increasing the entertainment content. With this development, radio had gone commercial within its first two decades, condemning educational radio to be a future of struggle for funding (DeFleur & Dennis, 1991), Dominick, 2005).

However, many governments recognised the great potential of radio as a cheap means of mass education and included it in their development strategies. For instance, in the USA, the Federal Communications Commission (FCC) set aside several frequencies or educational broadcasting in 1945 (Dominick, 2005). In Britain the BBC was set up in 1927 with the role of acting as a trustee for the national interest, and was later to start broadcasting educational programmes for Open University in 1971 (Mohanty, 1992).

Radio especially for educational purposes, was quickly spread to the developing world by colonialists (Coppin, 1970). Soon, there were numerous reports of about the success and challenges of educational radio broadcasting in developing countries (Schramm et al 1967; Gutelman, 1979, Ouane, 1984). Schramm, et al (1967), in particular, tried to give guidelines on the efficient and effective use of educational radio, and other mass instructional media. Since then, educationists worldwide have recognised the benefits of educational radio broadcasting in developing countries as noted by Bates (1984). This included among others that:



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- 1) to increase access to education against high enrolment caused by the global pressure to provide Universal primary education and compounded by a population explosion; as well as acute resource scarcities in terms of supplies of teachers, buildings, equipment and textbooks which have not measured to the rising demand for education. Marginal areas were particularly affected in this sense. In such situation, radio was used for direct instruction. (Mayo (1990).

To improve the quality of education by enriching or augmenting the teachers' classroom instruction in cases of insufficient teacher training,

- 2) inadequate resource supply etc. In such cases, radio can be used to diffuse superior curricular and instructional methods quickly. And on a broad scale, thereby helping reform education (KIE, 2005).
- 3) By improving access to quality education to all children in the country, to ensure equity in education and development is achieved. Bishop (1989) noted that in developing countries where education is based on a national curriculum, this uniformity in curriculum implementation is very important.
- 4) Radio is cost effective way of providing education in developing countries where finance s are scarce. Students to teacher ratio can be raised without necessarily increasing the teacher pay pack (Bishop, 1989). Radio is also a chap means of distributing live and pre recorded programmes when audio recorders are used (Mayo 1990).
- 5) Teachers can also be trained and re-trained cheaply at a distance using radio broadcasts (Gutelman, 1979; Kinyanjui, 2006).

However, in Kenya broadcasts to schools started in 1963 when the school broadcasting Division of the then Ministry of Education was established. It was later expanded in 1976 and moved to Kenya Institute of Education and was renamed Educational Media Service (EMS).whose responsibility was to produce and broadcasts educational materials to schools through what was then the voice of Kenya VOK). The EMS was subsequently absorbed into the Kenya Institute of Education (KIE that year (KIE, 2005)

The broadcasts to schools continued through VOK (which later became KCB in 1989) up to 1995, when they ceased due to lack of funds following commercialisation of KBC Ministry of Education, Science and technology, 2005). The EMS continued producing programmes in house for selling to schools or individuals. Then the Koech Commission of 1999 recommended that the ministry of education collaborate with the Ministry of information and broadcasting and the other media houses for allocation of airtime to promote alternative

and continuing education. As a result, the broadcasts to schools resumed in 2002 through the World Space radio system (KIE, 2005) and secondary schools were expected to use the programmes in teaching and learning.

By 2006, the schools broadcast audience through World Space radio was quite low (KIE, 2005, Nyakilti, 2006), perhaps due to the combined effect of the complexity of the system and the high subscription fee and involved. With the launching of free primary education in (2003), a government task force (Ministry of Education Science &Technology, 2003 recommended expansion and strengthening of the school broadcasts in the wake of high enrolments in primary schools.

In January 2997, a world Bank funded initiative enabled the resumption of the schools broadcasts through KBC AM and FM English service transmissions. The extent of utilization of the broadcasts and their impact is the focus of this study.

II. STATEMENT OF THE PROBLEM

There has been a problem of teaching science in secondary schools due to poor teaching methods that are teacher centred, as well as lack of adequate teaching and learning resources, with the consequence of low learner motivation and test achievement (SMASSE, 2001; Western Region KCSE Analysis 2005). As a result, attempt have been made to improve the quality of teaching and learning science in secondary schools through the SMASSE (Strengthening of mathematics and Science subject Education) project. SMASSE is an in-service training for secondary schools mathematics and science teachers that advocates for a learner-centred approach involving use of a variety of methods, activities and media so as to stimulate students interest in mathematics and science. The use of radio programmes in teaching and learning has been recognised as useful for motivating students to learn (Ball,1974, Walugere, 1983). Despite school radio broadcasts existence in Kenya for over three decades, there is scarce information about the use of radio in science (Chemistry) education. In Vihiga county in particular, there is no documented information on whether the secondary schools are using the broadcasts in teaching and learning chemistry subject.

This study will focus on the utilization of the broadcasts and will try to put any problems discovered in the perspective of instructional and broadcasting principles, an approach which most of the previous research has not undertaken clearly.

III. PURPOSE AND OBJECTIVES OF THE STUDY

The purpose of this study was to determine the extent of the use of educational radio broadcasts in secondary science (chemistry) instruction in Vihiga District and to investigate the problems hampering the efficient and effective use of the broadcast if any. The specific objectives of the study were: to



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investigate whether schools use radio programmes in science instruction; to find out the frequency of use of the radio programmes in each form 3 science subjects included in the broadcast timetable; to identify the problems teachers encounter in using the broadcast science lessons; to establish the impact of the radio broadcasts on the teaching and learning process as viewed by students and teachers.

IV. RESEARCH QUESTIONS

- 1) What percentage of secondary schools use radio programmes for science instruction in Vihiga County?
- 2) How often do form three science students use radio programmes?
- 3) How do teachers use the broadcasts in their lessons?
- 4) What problems do science teachers encounter in using the broadcasts?
- 5) What are the attitudes of teachers and students towards the use of science radio programmes?

V. THEORETICAL FRAMEWORK

The efficient use of educational radio broadcasts is facilitated by a harmonious convergence of the principles of human communication, mass communication and instructional technology, all being avenues of educational communication. Problems of utilizations of educational radio broadcast arise when there is a lack of good understanding and application of the principals of human communication, mass communication and instructional technology with the consequences of low efficiency in the use of science radio broadcasts.

The basis of the whole process of educational radio broadcasting is the general process of human communication which involves a source, a process of encoding, a message, a channel, a process of decoding, a receiver; the potential of feedback, the chance of noise.

However, in face to face communication, as when a teacher is talking before a class of pupils, this process is conducted with a high degree of efficiency, particularly due to the availability of immediate feedback from the audience, which enables the source to modify their message accordingly against any interfering noise, poor encoding or decoding, etc.

In mass communication, however, the communication process is beset by various problems in most of the steps listed above. The problems in mass communication e.g. radio broadcasting, arise from the nature of mass communication itself, which is characterised by a separation in space and /or time between the source and the receiver, and an audience that is large and diverse (heterogeneous). DeFleur and Dennis (1991) distinguish five distinct stages of the mass communication process in which problems may arise as follows:

- 1) A message is formulated by professional communicators (here educators at the KIE).
- 2) The message is sent out in a relatively rapid and continuous way through the media (in this case radio broadcasting).
- 3) The message reaches relatively large and diverse mass audiences who attend to the media in selective ways.
- 4) Individual member of the audience interpret the message in such a way that they experience meanings that are more or less parallel or congruent to those intended by the professional communicators.
- 5) As a result of experiencing these meanings members of the audiences are influenced in some way i.e. the communication has some effect or impact.

As an example of the problems encountered in radio as a form of mass communication, there is lack of immediate feedback Ball (1974) documented a number of other problems in educational radio broadcasting e.g. numerous noise sources, incongruence in language etc. Further more, media experts have stated that educational radio needs the basic media support systems such as advertising and publicity so as to sell itself to the intended audience (Mayo 1990).

Then there is a very crucial role of instructional technology in the process of educational broadcasting. The educators or professional communicators at the KIE and the teachers at the school level need to use the principals of instructional technology so as to design the radio curriculum manage it and evaluate it effectively and efficiently. Problems arise when these people do not formulate good radio lessons or when they do not use radio efficiently as a medium of mass instruction, among many other factors. In particular teachers have been observed to have problems of integrating educational radio broadcasts in their lessons (Ball, 1974, Bates 1984, Hawkrigde & Robinson 1982; Mayo 1990, Mayo 1990, Mohanty, 1992, Chambers & North edge, 1997, Forsyth, et al 1999).

Figure 1 summarises the interrelationship between the three major factors discussed here that influences the utilization of educational radio broadcasts.

VI. METHODOLOGY

A descriptive survey design including both qualitative and quantitative methods was used in this study, together with an observational research. The survey as a research design is widely used in communication research, like the present one, particularly for studying the behaviour or characteristics of audiences (DeFleur & Dennis 1991). The purpose of a survey design is to generalise from a sample to a population (Creswell, 2003). It has the advantages of being economical, and provides data that is easily analysed since it is best done with a formal questionnaire (DeFleur & Dennis, 1991).



The observation schedule, on the other hand, is less formally structured than the survey. Though it is more difficult and time consuming, it is ideal for obtaining detailed and sensitive qualitative information about a complex social process, uncovering patterns and processes that experiments and surveys could never find.

The Study Area

The study was carried out in Vihiga County Western region of Kenya. It is a rural area and is highly populated. And therefore has many secondary schools. Some areas of the County, especially those along the Kisumu to Kakamega tarmac road, look semi-urban, whereas most other areas have a very poor road network.

In the Vihiga, Chavakali and Sabatia Divisions, however, there is an appreciable supply of mains electricity, as compared to the Emmuhya and Luanda Divisions. Vihiga county therefore is a miniature representation of both the rural and urban settings in Kenya and consequently an ideal area for research in the utilization of school radio broadcasts.

The researcher agrees with the KIE (2005) that it is in such rural areas that can benefit greatly from school radio broadcasts as the schools here are under privileged in many aspects: limited range of contacts, poor in creative and intellectual resources, under financed as the community is poor resulting in few learning materials, a uniform and varying back of the children level of education, and generally a traditional bound and static rural community life.

The Study Population

The study population consisted of 62 secondary schools in Vihiga County., together with 3,000 science teachers and 1000 form three students in these schools. Out of the 62 schools two namely, River side High school and Vihiga Academy were private, while the rest were public secondary schools (Vihiga, BEB, 2007).

Sample and Sampling Procedure

The study sample consisted of 20 schools representing 32% of the population. To get these 20 schools, cluster sampling was used to select 4 schools from sabatia, 4 from Chavakali, 4 from Vihiga, 4 from Emuhaya and 4 from Luanda, proportionate to the schools population in each division and randomly selected.

In each school, the head teacher, form 3 science (Chemistry, Biology and Physics) teachers and all form 3 students were involved in the study. However, only 15 students in each school, selected randomly to represent 30% of the population responded to the student's questionnaire.

Instrument of Data Collection

The instruments for data collection included a structured interview schedule for head teachers used to investigate the organisation of radio listening in the schools. A questionnaire was also used for collecting data from form-three science teachers to assess programmes usage and problems. Another questionnaire was designed for students to assess their views about the science radio programmes quality and usage in their classes. The researcher also prepared and gave students two chemistry tests based on one series of radio lessons to assess correlation between students learning achievement and use of radio. There was also an observation schedule for on-the-spot assessment of the utilization of the radio programmes during broadcast times.

Validity and Reliability of the Research Instruments

All the research instruments were subjected to various aspects of validity and reliability. The questionnaires were examined by educational media experts for reliability and any correction was done. According to Borg and Gall (2007), an instrument is regarded to be valid when it can measure what is supposed to be measured and reliable when it can produce the expected results (Peter 1994). To ensure high reliability of the instruments a pilot study was carried out in two schools where the research instruments were pre-tested. After which the instruments were revised accordingly.

Data Collection and Analysis Procedures

Data collected was coded and analysed both qualitatively and quantitatively using descriptive statistics. The quantitative data analysis and interpretation involved the use of fractions, percentages and means. Some of the percentages and means was been used to draw charts giving pictorial representations of the findings. The qualitative data was coded, analysed and patterns of issues determined from it, for comparison with the results of the qualitative analysis. Overall, the findings were summarized according to the objectives of the study and theoretical framework.

VII. RESEARCH FINDINGS

The main research findings were organised and presented as follows:

Use of radio to teach Chemistry in Vihiga county: the major findings of this research was that the use of radio to teach chemistry in secondary schools in Vihiga County was very low. Out of the 12 schools in the study sample, only one school was found to have used the radio broadcasts to teach Form 3 chemistry during the study period, representing about 8% of the schools in the county. Figure one gives more information.



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Even in this school, the radio lessons were only used twice during the study period. This school was the only one, which had a policy encouraging teachers to use the school broadcasts in their lesson, and had consequently incorporated the Broadcast to Schools Timetable in the school timetable. This little and admirable effort to use radio to teach chemistry in this school came against some odds. Neither the head teacher nor the chemistry teacher had attended the sensitization seminar on school broadcasts organised by the District Education officer in Vihiga and the schools had no radio despite receiving the broadcast to School timetable, so it relies on radio borrowed from the teachers in the school. The school was however, connected to the main electricity supply which could enable the use of powerful radio-cassette recorder/disk recording equipment.

The other results showed that there were several reasons that accounted for the low extent of the use of radio to teach chemistry in Vihiga county secondary schools. This included:

- 1) Lack of awareness/publicity about the radio broadcast programmes
- 2) Lack of policy on the use of radio to teach in schools
- 3) Lack of the required hardware
- 4) Insufficient technical knowledge on how to use the radio programmes in teaching and learning.

These factors hampered the extensive use of radio to teach chemistry subject in Vihiga County secondary schools. Further analysis indicated that teachers were not well informed about the need to use school radio programmes. There is need to sensitise schools by organising workshops to help in the rapid diffusion of teaching innovations (Kemmerer (1990). Mayo (1990) also agrees with Kemmerer and stress the need for third world countries educators to be exposed to new and exemplary educational programmes and formats to use radio lessons.

Unfortunately, lack of adequate publicity about the use of school radio broadcasts for secondary schools was another major problem that hinders the extensive utilization of the programs. The approach used by the producers seemed to have been ineffective in reaching the teachers as all the 12 head teachers in the study schools reported not attending the workshops organised by the District Education Officer. At the same time all of the head teachers went further to report that they were not invited for the workshop and yet, according to mass communication experts, head teachers act as opinion leaders in their schools and as such should be targeted for diffusing the use of radio in their schools (Defleur & Dennis 1991) Even the 19 chemistry teachers who responded to the teachers' questionnaires also reported no attendance due to lack of invitation to the workshop. The other findings indicated that only four schools had a broadcast to school time table and only one of the 19 teachers had contacted KIE about the programmes.

Lack of policy on the use of Radio to teach in schools

Out of the 12 schools in the study sample, only one school had a school policy encouraging teachers to use radio broadcasts in their lessons and actually had their broadcast timetable incorporated in the school timetable. Further more, none of the 19 chemistry teachers in the study sample was incorporating the radio programmes in their lessons plans. The teachers gave various reasons for not planning for the use of radio in their lessons with most of them (53%) citing lack of a school policy on radio use.

However, the findings also indicated that most of the head teachers (50%) reported that radio programmes are useful in teaching students, while majority of the chemistry teachers (58%) thought that radio lessons are not useful in teaching of the subject to students, giving reasons such as:

- 1) The programmes are too expensive;
- 2) The programmes interfere with the school timetable;
- 3) The radio lessons should be incorporated in the syllabus
- 4) That radio programmes are not good for students because they cannot easily visualize the concepts being taught, and the students questions cannot be answered immediately.

These comments actually indicate that most of the chemistry teachers lack knowledge about the usefulness of instructional radio broadcasts and how to use them in their lessons.

Finally, none of the 19 chemistry teachers in the study sample had listened to any of the programmes for teachers, citing a lack of awareness about the existence of the programmes.

Lack of the necessary Radio hardware

Data collected using the head teachers questionnaire revealed that (50% of the schools in Vihiga district have no radio sets, 33% have radio-cassette recorders/players, while 17% have radios without cassette recorders/players.' However, none of schools with the radio-cassette recorders were recording the broadcast radio lessons. About 83% of the schools have main electricity supply. Of the schools with radios, again 83% reported using electricity during radio broadcast. Only 17% of the schools reported using dry cell as an alternative power source, with no school using a car or solar battery. Finally, none of the schools reported having any kind of broadcast support materials from the KIE programme producers.

Analysis of the above information reveals that half of the school in the county lack radio sets for listening to the schools broadcasts despite the high availability of mains electricity power in the schools. Clearly this hampered the extensive use of radio to teach chemistry in the county secondary schools. In addition, due to lack of support materials such as timetables, radio sets, teachers guide notes students' pamphlets and visual aids it was hard for chemistry



teachers to plan for the radio lessons in advance, be able to conduct pre-broadcast, during broadcast and after broadcast activities.

Insufficient Technical Knowledge on How to use radios broadcast lessons

There were many comments made by the head teachers and chemistry teachers which indicated that they had insufficient technical knowledge on how to use radio broadcast programmes in their lessons. The relevant comments from the head teachers were as follows:

One of the interviewee said that “it is a challenge for us to introduce” Another one remarked” the school timetable is disrupted by the radio broadcast-time table” In addition, a chemistry teacher requested that KIE should give one national timetable incorporating the radio broadcasts. The other comments made by the 4 of head teachers was that “the secondary school curriculum is congested and our priority is to complete the syllabus in time” so we do not use broadcast lessons” These comments show that head teachers do not know how to organize radio listening in their schools. The comments about completing the congested syllabus indicates that head teachers do not know that the radio broadcast can, in fact help them complete teaching the congested syllabus in time, if well used.

Another of the four head teachers complained about the frequent power black out as a problem hampering the use of radio in chemistry subject. To an educational media expert, however, this shows a lack of knowledge that back-up power, such as dry cells or a lead-acid battery, can solve the problem. Two other head teachers reported that unreliable weather in the form of thunderstorms in the afternoons in this part of Western Kenya hampered listening. This problem was a genuine one, but can be overcome by using recorded radio programmes which can be used at a convenient time.

Comments from Chemistry teachers

Some chemistry teachers in the study sample also gave interesting comments explaining the problems they encounter in using the radio broadcasts. The key comments were as follows:

“The first teacher said “radio lessons should be incorporated in the syllabus.”

The second one reported that “use of radio broadcasts requires a smaller group of students” Another teacher noted that “students have divided attention and problems with pronunciation.” Bad weather in form of thunderstorms in the afternoons hampers listening to the broadcasts.”

Just as in the case of head teachers’ comments about bad weather, the teachers’ problem with the idea that a concept once explained on a radio programme is not repeated and can be solved by recording the programmes or acquiring the

recorded audio cassette and playing it later as many times as one wishes.

Lastly, the teachers reported their preferred radio band for tuning in to the KBC transmissions of schools broadcasts and the results indicated that 21% used AM band because it was clear and better, 37% said FM band was better and clearer, while 42% were undecided. However, the truth is that both bands are capable of delivering a clear sound output depending on the location of the radio receiver and how well the radio is tuned by someone. AM signals are clear the closer the radio is to the transmitter and when the length of the radio faces the transmitter. On the other hand, FM signals are clear in raised areas in the line-of-sight with transmitter, away from magnetic materials such as from iron roofs and grills, and with the telescope antenna well oriented in space. These are the technical details of tuning an AM-FM radio receiver, which teachers need to know so as not to waste time using trial-and error. Lastly, the broadcast to schools timetable has the exact transmission frequencies for the AM and FM signals available in different areas in Kenya to help teachers tune their radios quickly.

VIII. CONCLUSIONS

The study revealed that there was lack of adequate awareness and publicity about the school’s radio broadcasts appeared to be the major reason for the low extent of use of the chemistry radio broadcasts. This is because none of the head teachers and chemistry teachers in the study sample reported having attended the publicity and sensitization seminar organised by the Vihiga District education office.

Secondly there was poor publicity about the school radio broadcasts which resulted in a low level of awareness about this teaching innovation in secondary schools. This was in breach of what social scientists have established about the process of adopting an innovation, a kind of social change in a society. This process starts with awareness stage in which news of the innovation becomes available and people learn about it (Defleur and Denis (1991)). The various forms of the mass media can facilitate the fast and widespread availability of that information. The awareness stage is followed by the interest stage (in which people seek more information about the innovation), the evaluation stage (in which people decide whether to try it, the trial stage (in which people decide whether to try it), trial stage (in which people apply the idea on a small scale to determine its utility), and finally the adoption stage in which the individual use new items or idea continuously on a full scale. When many individuals decide to adopt the innovation and it comes into common use in society, the diffusion of the innovation has occurred.

The kind of publicity that educational radio broadcasting required involved the elements of sensitizing of teachers, which is essentially a combination of the interest and evaluation stage in the process of adoption of an innovation. Sensitization involves telling teachers how the use of radio is



important in the teaching and learning process so that they can decide whether to try it. However, in the case of Vihiga County secondary schools, the findings indicated that the KIE radio producers and the entire broadcast radio distribution system failed in this role of publicizing the school radio broadcasts. The reasons for this failure calls for further research. The other major concern was the findings on lack of school policy on the use of radio, lack of the necessary radio materials and insufficient technical know-how on the use of school radio programmes.

Overall, it can be said that chemistry radio broadcasts had very little impact on the teaching and learning of chemistry in Vihiga County secondary schools because a major mass communication steps that of program promotion, and some aspects of instructional technology, have been poorly conducted by the Kenya Institute of Education. The study therefore recommends that effective promotional activities for the radio lessons should be carried out by the producers and curriculum developers so that more schools should use the programmes.

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