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Using mother tongue as a medium of instruction in the teaching of mathematics in the Zimbabwean junior primary schools : Desirable or feasible?

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Abstract

The use of mother tongue as a medium of instruction debate has been on the cards for a long time now in Zimbabwe but has never had any genuine implementation commitment from the policy makers. The study focuses on language use and challenges teachers and pupils face in the classroom in their attempt to use mother tongue in the teaching and learning of mathematics at junior primary level. The study sample comprised 32 teachers from Masvingo urban primary schools, 32 of their lessons were observed and learners from these classes participated in the study. Observation protocol and a structured questionnaire were the data collection instruments. The research found out that the use of mother tongue in teaching mathematics may not be achieved soon. Consultations with relevant stakeholders, attitude change and resource production and mobilisation are among some of the many issues militating against the use of mother tongue as a medium of instruction in mathematics. One of the major recommendation was to have an all stakeholder conference, comprising politicians, academics , language experts, representatives from countries where mother tongue tuition has been successfully implemented in educational settings; teachers and parents to openly debate the feasibility of using mother tongue as a medium of instruction in education in general. Mathematics would obviously benefit from such a conference.

Background

The Judges Commission of 1962 set the tone for a language policy which required English to be 'compulsorily and idiomatically' employed in the teaching of other subjects [Nziramasanga, 1999]. This marked the beginning of the marginalisation of indigenous languages in the Zimbabwean classrooms. The position remained unchallenged for a long time, maybe with some silent critics, until after independence. The real change in policy came into effect through the Education Act of 1987 amended in 1996 which recognised the language of instruction from grade one to three to be the child 's first language and English from grade four upwards . The 2006 amendment to the Education Act clearly spelt out that prior to form one, any one of the languages, Shona, English and Ndebele **may** be used as the medium of instruction, depending upon which language is commonly spoken and better understood by the pupils. Interestingly, the colonial Education Act of 1979 was unequivocal on the language of instruction, and says that the language of instruction at all schools **shall** be English. However, researchers have cited implementation of these policies as real practical challenges hence the use of tentative and noncommittal words like` may. `

Secretary's Minute Circular Number 2 of 2001, Number 1 of 2002, the Nziramasanga Commission of Inquiry into Education and Training of 1999 and the amended Education Act of 2006 show some commitment towards the use of mother tongue in the teaching – learning situation at junior primary level. As the mother tongue instruction debate intensifies, using it to teach mathematics seems to offer some real challenges for both teachers and pupils. The questions have been, 'Will the use of mother tongue simplify or complicate matters in mathematics teaching?' 'Do teachers and pupils desire it as a medium of instruction in mathematics teaching?' Sceptics feel using mother tongue as the language of instruction in mathematics will bring about a watered down version of mathematics in Zimbabwe, may be Zimmaths as was the case with Zimsci which was regarded as inferior. Researchers and proponents of mother tongue instruction on the other hand, feel the use of mother tongue in mathematics teaching reduces 'instructional dead time' [Rose, 2000] as shown in most lessons where there is a mismatch between the child's first language and the language

of instruction. The pupil leaves the classroom with no concept mastered.

Currently, in Zimbabwe, English is the language of instruction in mathematics, in mathematics textbooks and other related materials. In the classroom, teachers have used a language which best conveys skills and concepts be it English or the pupil's mother tongue or both. Thus, the study sought to find out teachers and pupils' attitudes towards mother tongue as a medium of instruction in mathematics teaching and learning, the language preferences of teachers and pupils in mathematics lessons and assess the availability of relevant teaching and learning materials (teaching aids and textbooks) in mother tongue to teach mathematics at junior primary level.

Theoretical Framework

The study is premised on Dewey's progressivist philosophy which states that it was time that we subordinate subject matter to the learner and the needs and interests of learners must be considered by recognising that learners bring their language, bodies, emotions, and spirits to school as well as their minds [Oliva, 1982]. Progressivists like Dewey, believe in democracy even in the classroom so that there are no authoritarian practices at school and in classrooms. The classroom should be a free environment in which every individual child's differences and growth is seriously taken care of. This includes the language the child would feel comfortable to use especially in mathematics so that they could be heard. The mathematical content and language should be close to the child's real life situations hence the cliché; 'Education is life and learn by doing'. The fundamental question is,' How can children learn to do mathematics in a language they are struggling to understand?' In line with this, Mavhunga [2008] says that there is urgent need to realign our education system so that it addresses the real needs and aspirations of the African people as determined by the Africans themselves. Siyakwazi[1995] in Mavhunga[2005] quoting the Phelps-Stokes Commission Report of 1924 warned that artificially and irrelevant elements of the content of a school curriculum that originated in distant parts of the world tended to confuse the mind of the African child. The above sentiments by Mavhunga and Siyakwazi aptly summarise progressivism thinking that curriculum decisions especially on language should put the child at the centre by making use of the child's language in educational settings.

Review of related literature

The importance of mother tongue instruction

According to a research by Nenty [1999] on the influence of language on pupils' performance in science and mathematics, classroom use of a language which is not the language already spoken by the child results in cognitive and pedagogical difficulties. The language of instruction contributes significantly to the quality of contributions and overall academic performance of pupils. The difficulties pupils face in terms of language in the classroom are articulated by two points raised by Bird and Welford [1995: 35] that ; a] pupils are hindered if they are unable to articulate clearly in their second language and b] language problems may interfere in pupils' understanding of questions. The two are core classroom activities that help restore difficulties inherent in pupils' learning. Teaching in English and using it in the attempt to determine mathematics achievement, the dice is significantly loaded against the speakers of English as a second language [Nenty, 1999].

The Zimbabwean classroom situation continues to be dominated by English from primary to tertiary level and ChiShona and IsiNdebele are not officially used as mediums of instruction [Chimhundu, 1988].The language of instruction should help create mutual dialogue between the teacher and the pupils as well as among the pupils themselves.

Considerations should be made to use a language in educational settings that help the pupil gain literacy and numeric skills. A number of studies have shown the merits of using mother tongue as the medium of instruction in education. The argument is based on the theory that children who learn to read and write in their mother tongue do better than children obliged to learn to read and write in a second language [Africa News, 2003]. Studies in Kenya, Botswana, South Africa Malawi and Mali have shown that mother tongue instruction is the best policy. According to SIL UK [2003] when the language of instruction is not the mother tongue, it places double demand on the pupil, first, the demand on language acquisition and second, concept learning and meaning making. The language experience of the pupil should be harnessed in formal learning situations so that the pupil becomes an active rather than a passive participant in the learning process [Gondo, Nyota and Mapara, 2005]. The argument rests on creating a friendly language environment in the classroom. Researches and studies, agree that the use of mother tongue as a medium of instruction makes it possible for numeric achievement and development.

Mother tongue instruction and mathematics teaching and learning

Nyagura's [1989] research on mathematics attainment in Zimbabwean primary schools concluded that most grade seven pupils show very low ability to apply mathematical ideas to real life problems even in those involving practical concepts such as gain, loss, interest, discount and sales tax, those story problems that require reading and comprehension of the language used and English as the language of textbooks and of instruction has failed the pupils. Observations are that for substantial teaching and learning and correct concept and content discourse to occur in mathematics, the pupils' mother tongue is very important [Carey, 1991, Cummins, 1994 and Cuevas and Beech 1983 in Raborn, 1995].

Mathematics is a nightmare for many pupils and has created a mathematics fever [Wu, 1995]. One of Dube and Cleghorn's [1999] research findings is that pupils do not make mathematical progress because they do not understand what they are taught due to their inability to understand the language of instruction. The use of mother tongue according to Rose [2000] reduces what she terms 'instructional dead time'. This is when teachers use English or a language which pupils do not understand and the whole mathematical lesson shows a mismatch between the child's mother tongue and the language of instruction resulting in school failure [Williams and Wyne, 2000]. How can the teacher mediate between the pupils and textbook mathematical language and between pupils and the English language teachers use in mathematics? Sierpinska [2001] observes that with these dilemmas, the central point is using the mother tongue so that pupils do not miss the chance of improving both their mathematics thinking and communication skills. Setati's [2005] research in South Africa revealed that using English only in primary mathematics classroom where English is not the main mother tongue of learners has negative effect on pupils' meaning making and problem-solving. Grappling with English and mathematical content and concepts coupled with mathematical phobia, further complicates and exerts a lot of strain to the pupils. Mother tongue as a medium of instruction, thus, has a support effect on the teaching and learning of mathematics especially at primary school level and may lead to the demystification of mathematics.

Attitudes of teachers and pupils towards mother tongue instruction in mathematics

The attitudes people have to a language in terms of its use is a function of the social and political perception of the language in multilingual settings. Ndamba's [1999] research reports that the general function of language in a given country is contributory to attitudes towards the language of instruction.

English has occupied a special place in the Zimbabwean education system because of the utility attached to it in the classroom as well as other demand areas and general life outside school .In this regard, English has been regarded as the dominant symbolic resource in the linguistic market in Zimbabwe and competence in English is required for access to social, educational and eventually material resources [Sierpinska, 2001]. According to Natsa [2001], when the mother tongue policy as the medium of instruction was muted at primary level and throughout the academic life of the children, it was seen by the generality of the Zimbabwean population as a grand plan to deny Zimbabwean children access to socio-economic advancement. Nyawaranda [2000] perceives English as an economic gatekeeper, those with the language pass through. English is seen as providing a series of opportunities to pupils. Industry and commerce and all training institutions require that candidates have English and mathematics at 'O' level. In line with this, Mavhunga [2005] observes that the language of the former colonial master, namely English, has remained the medium of instruction in public and private schools. Furthermore, the 'O' level school-leaving certificate cannot be complete unless one passes at least five subjects, including English and now mathematics added to the list.

The above background has created some negative attitudes towards mother tongue as pupils are made to understand that their first language is less important and it is not the language of education. Giglioli [1990] goes on to say that when the everyday language of the pupil is stigmatised as no language at all and confined to less important facets of life and not possessing the means for logical thought, it contributes to the negative attitude pupils and teachers have towards that language. This has resulted in the mother tongue being relegated to oral usage, individual/ community usage, emotional attachment, village solidarity and personal loyalties [Robinson, 1996]. Webb [1999] goes on to say that despite the negative attitude towards mother tongue instruction by teachers and pupils, poor performance in mathematics seems to result not only from their lack of knowledge in the subject but also because of their lack of effective grasp of the means through which such knowledge is communicated to them and through which they communicate how much they know mathematics to their teachers and examiners.

Zimbabwe can learn a lot from the experiences in Lesotho, Kenya, India, Japan, China and other countries that have adopted the mother tongue as the medium of instruction for formal educational experiences with special references to mathematics.

Availability of necessary prerequisites in using mother tongue in mathematics teaching in Zimbabwe

Mathematics vocabulary

There is some special vocabulary in mathematics according to Raborn [1995]. Mathematics vocabulary is said to be precise but not always familiar. Thompson and Rubenstein [2000] say that pupils need to master this mathematics language if they are to read, understand and discuss mathematical ideas. Unlike common English and our mother tongue, which pupils hear, see and use daily in reading, watching television, conversation and elsewhere, the language of mathematics is limited to school [Thompson and Rubenstein, 2000]. What has been noted by Rose [2000: 521] is that vocabulary problems are easily overlooked in mathematics yet it is important in creating an enabling environment hence contributing to 'an educational village' where all learners speak and understand each other with little difficulties.

Every language can represent concepts and knowledge in areas in mathematics in its own way best understood by its people [Buffer and Laugksch, 2004]. The same sentiments are echoed by Gondo, Nyota and Mapara [2005] that translation studies have been used throughout history to solve problems of coming up with registers in other languages. Language is capable of manufacturing and developing new words as long as it is in active use. What is needed is what Ball and Bass [2000: 53] call 'unpacking of mathematical language and content for pedagogical purposes.' Mathematics language can be made simpler and accessible to all pupils in their own mother tongue for effective teaching and learning. The scepticism has been whether mathematical vocabulary can well be represented in our own mother tongue without necessarily compromising the learning of basic mathematical concepts and facts. Observational studies by Chazan and Ball [1999] show that it can be done as long as the vocabulary is acceptable to all and captures mathematics essentials.

Availability of material resources

What has hindered development in the use of mother tongue as a medium of instruction in mathematics in Zimbabwe has been the absence of necessary material resources such as textbooks, articles, journals, charts, pupils and teachers' handbooks and other instructional materials in the mother tongue. Ngugi [1994] laments the present use of English in most African schools when he says that the language of the books is foreign. This according to him has left the pupils without a language in the classroom resulting in low achievement.

Most African countries [Zimbabwe included] have very weak national language policies and this has resulted in foreign languages being used in most textbooks and in educational settings. Briars [1999] thinks there is need to be proactive in terms of policy and practices so that changes may be made in textbook adoption and or review the available mathematics textbooks so that they are adapted and translated to mother tongue to meet and support the child's mathematical communication needs. The present situation where even if mathematical books do come home, their content and language is so difficult for their parents' experiences that most are at a loss about how to help their children, is most undesirable and does not help anyone.

Teacher expertise

Ball [2003] says that mathematics requires well trained teachers who are sensitive to the need for precision. He goes on to say that precision requires that language and ideas be meticulously specified so that mathematical problem solving is not unnecessarily impeded by ambiguities of meaning and interpretation. What has surfaced in the Zimbabwean education system is what Gatawa [1990] terms a mixed bag of teachers. The content of Gatawa's observation is that in the Zimbabwean primary schools, some teachers have not done mathematics at 'O' level, some have them up to 'A' level, some had some minimal contact with mathematics at college and some sat several times before passing them and these teachers have taught mathematics with varying degrees of success. Chapman [1996] views many teachers who were taught in a foreign language to have had terrible mathematics experiences in school and the need for a better mathematics experience for today's children cannot be overemphasised. Briars[1999] observes that any reform especially mathematical reform requires that teachers be reoriented towards mother tongue language in teaching and learning that ensures that a teacher in every classroom

engages the pupils that ensures high level achievement.

Purpose of Study

The study sought to establish Zimbabwean junior primary school teachers and pupils' language choices based on the two (English and mother tongue) as mediums of instruction in the teaching and learning of mathematics. Furthermore, the study also intended to assess the actual language use and preferences in the classroom during mathematics teaching and learning with the view of establishing the role of mother tongue.

Methodology

The study was a descriptive survey taking into account both qualitative and quantitative paradigms. Data was collected through non participant observation protocol and questionnaires. The use of both paradigms complemented each other producing valid, reliable dependable knowledge which could help to describe, understand, explain, interpret, predict and solve educational problems [Magagula, 1996]. Mixing the two helped bring different images of understanding from teachers and pupils on the use of mother tongue in the teaching of mathematics at junior primary level.

Sample

Purposive sampling was used to come up with eight [8] participating primary schools, 32 qualified junior primary school teachers and 32 of their lessons were observed. At each school four teachers[4] were conveniently selected targeting those teaching mathematics at the junior primary levels ,that is ,grade four[4] to seven[7].The research did not take into account gender representation. The pupils from sampled lessons automatically participated in the study especially with their valuable contribution and interaction with their teachers and among themselves during mathematics teaching and learning.

Instruments

The research instruments used were observation and questionnaires.

Observation

Non participant observation was used to record and learn the lived classroom experiences of junior primary school teachers and pupils in terms of the use of mother tongue as a medium of instruction in mathematics. The use of observation was done to avoid over- reliance on participants` self reported responses through the questionnaire. Specifically, the observation protocol addressed issues of teachers' language preferences, pupils' attitudes towards mother tongue use and availability of requisite vocabulary and related materials in using mother tongue during mathematics teaching.

Questionnaire

The questionnaire was administered to the thirty [32] teachers who participated in the study. The questions were on how teachers viewed the use of mother tongue as a medium of instruction option in the teaching of mathematics, their own preferences, availability of materials support services in place to use mother tongue in the teaching of mathematics. The questionnaire, at the end, had provision for some other emerging issues not captured in the questions and this was meant to ensure that all other relevant and' missed' data was captured.

Findings

Data obtained through questionnaires and lesson observations showing language preferences, attitudes of teachers and pupils and relevant teaching and learning materials in mathematics teaching were presented in tables as shown below. NB: The percentages are to the nearest whole number.

Table1: Teachers' language preferences when teaching mathematics, data from questionnaire.

		SA		A		DA		SD		Total
Statement	No of teachers	freq	%	freq	%	freq	%	freq	%	
Use of English in maths teaching is desirable	32	30	94	2	6	0	0	0	0	100
Teacher use of both English and mother tongue in maths lessons	32	15	47	16	50	1	3	0	0	100
Mother tongue simplifies maths concepts	32	17	53	10	32	3	9	2	6	100

Table 2: Teachers' language preferences as observed by the researchers during mathematics lessons

		always		some times		Not at all		Total
Statement	No of lessons	freq	%	freq	%	freq	%	
Use of English in maths lessons	32	20	63	9	28	3	9	100
Use of mother tongue in maths lessons	32	9	28	21	66	2	6	100
Use of both English and mother tongue in maths	32	26	81	5	16	1	3	100

Table 3: Pupils' attitude towards mother tongue and English as observed during lesson observations in group activities in mathematics lessons

		always		Sometimes		Not at all		Total
Statement	No of lessons	freq	%	freq	%	freq	%	
Pupils discussing maths concepts in English	32	5	16	23	72	4	12	100
Pupils discussing maths concepts in mother tongue	32	11	34	20	63	1	3	100
Pupils using both English and mother tongue during maths lessons	32	22	69	10	31	0	0	100

Table 4: Availability of mother tongue vocabulary as observed by the researchers during mathematics lessons.

		always		Sometimes		Not at all		Total
Statement	No of lessons	freq	%	freq	%	freq	%	
Pupils using correct English vocabulary during maths lessons	32	3	9	17	54	12	37	100
Pupils using correct mother tongue vocabulary during maths lessons	32	0	0	5	16	27	84	100
Pupils using literal translation during maths lessons	32	24	75	6	19	2	6	100

Table 5: Observed mother tongue textbooks and other teaching materials/ aids use during the teaching of mathematics

		often		Less often		Not at all		Total
Statement	No of lessons	freq	%	freq	%	freq	%	
Maths textbooks in mother tongue	32	0	0	0	0	32	100	100
Learning aids prepared in mother tongue	32	0	0	4	13	28	87	100

Based on the collected data from the questionnaire (Table 1), the study found that teachers had a strong liking for English in the teaching of mathematics with (32) 100% agreeing that the use of English in mathematics teaching is desirable. Teachers maybe were mainly guided by how English has been intensively and extensively used in most aspects of Zimbabwean life especially in examinations at all exit points. In line with this, one teacher wrote; 'You would put your job at risk in our examination driven system when pupils fail at grade 7 because you have been using mother tongue which is not the language of examinations.' While this was the situation regarding teachers, the research found out that pupils have struggled to come to terms with the English used let alone the mathematical vocabulary with group discussions characterised by the use of mother tongue with 31 groups ((97%) always and sometimes using mother tongue. From the data (Table 3) all the 32 groups (100%) observed either always or sometimes used both English and mother tongue during group discussions in mathematics lessons. The research also found out that mother tongue remains marginalised in the teaching of mathematics and only comes in to supplement English when teachers have difficulties in explaining concepts. On the open ended section of the questionnaire one teacher wrote,' Mother tongue is a critical player, called upon when the going gets tough for learners in understanding mathematical concepts. You make use of what they know in their immediate environment and in their language.' During one mathematics lesson one pupil used this Shona analogy about improper fraction, *'Mwana muhombe akatakurwa ne mwana muduku'* (literary translated, A big child being carried by a small child.) This was the language the pupils used in mathematics lessons and it seems mathematical communication was achieved even when ChiShona was used.

The major constraint was the unavailability of corresponding literature and reference materials in mother tongue to use to teach mathematics. In this regard, classroom mathematical teaching and learning was characterised by haphazard use of both English and mother tongue as shown by the researchers' observation that in 30 (94%) of the observed lessons pupils literally translated concepts and with varying terms for the same concept showing the need for harmonising mathematical vocabulary. For example one pupil had this to say; *Tinoplasa number mbiri idzi kuti tiburitse anza.* (We add these two figures to get an answer.) The use of both languages was in keeping with the teachers' desire to fine –tune language in schooling practices to match children's varied needs in rural, urban, high and low density schools thereby maximising children's access to mathematical knowledge and concepts [Dube and Cleghorn, 1999]. The two would reinforce each other in mathematics teaching and learning confirming Nyawaranda's [1999] position that the language of instruction cannot be effectively legislated by a language policy as teachers use a language that best serves the mathematical communication needs in the classroom. Further challenges were in the examinations that are set in English hence pupils should be acquainted with the mathematical language lest they would be mathematical failures as they find the examination not palatable. The balancing act [using both English and mother tongue] was an expression of the language use predicament which teachers found themselves in. This was also to run away from the 'one size fits all' approach to classroom mathematical discourse. What surfaced from the research was that both English and mother tongue have important functions in the pupil's education especially in mathematics.

From the study, technically correct mother tongue mathematics vocabulary, textbooks and relevant teaching and learning materials/aids were not readily available for teachers and pupils. The absence of these resulted in teachers and pupils using whatever mother tongue vocabulary at their disposal in mathematics lessons. What was, however, observed in classroom settings was that teachers and pupils did not complain about mathematical inadequacies of mother tongue vocabulary, in fact they found it useful, learner friendly and helpful in the teaching of mathematics. One teacher wrote at the end of the questionnaire, 'The potential is there for it [mother tongue] to be developed into a language of instruction in mathematics and what is needed is to put our heads

together to have the right vocabulary and teaching materials.'

The study established three positions by teachers as they wrote on the open ended section of the questionnaire. There emerged a group of teachers who felt that mother tongue should not be used at all in the teaching of mathematics. The second category were those who felt that it was time we afford and accord mother tongue the status of a language of instruction in mathematics and in the whole education system. Finally, there were those who felt that the use of mother tongue can wait until everything is in place and meanwhile both English and mother tongue can be used (codeswitching/ codemixing). There were two concerns and fears noted from teachers, and genuinely though, that mother tongue may fail to simplify and communicate accurately mathematical concepts and the general inertia to any change after years of using English. Teachers showed that they would rather remain in the comfort of how they have been doing it, using English. In most cases mother tongue did not have precise single words in mathematics and using a lot of words would end up distorting mathematical concepts. The teachers noted that the change should be necessitated by need not just for the sake of it .The three positions presented the thinking of teachers in the junior section of the Zimbabwean primary school about the position and use of mother tongue in mathematics and data from the tables has also shown the need for harmony. There is no consensus and to put it bluntly there is confusion.

Conclusions and Recommendations

Teachers and pupils did not always use mother tongue in the teaching of mathematics because of a number of constrains in resources and their positive attitude and preference of English. No attempt has been made to translate the current English mathematics textbooks and other related mathematical resources to mother tongue. Teachers have not been oriented towards the use of mother tongue in mathematics and primary teachers training colleges continue to churn out teachers with an English use bias. Furthermore, a lot of ground work is needed to come up with agreed terminology in mother tongue to teach mathematics. It is common knowledge that if a language is not in active use it becomes extinct but if in use it is capable of developing and manufacturing appropriate and acceptable new diction. There is need to go beyond the preconceived notion teachers, pupils and the general population have that knowledge and clear meaning resides in English and not in the mother tongue. The other let down has been the public examination by the examining authority Zimbabwe Schools Examination Council [ZimSEC] which has examinations in English hence teachers have no choice but to use the language of the examination. With English, the pupils had the problem of comprehension of the vocabulary and teachers had the problem of explaining mathematical concepts to the learners. Mother tongue has successfully mediated.

The study recommends an open debate and consultation involving all educational stakeholders including teachers and pupils to dialogue on the way forward especially on the possibility of using mother tongue in general educational settings and in mathematics in particular. It is at such forums that contentious issues like mother tongue mathematical vocabulary, production of textbooks and other related mathematical materials can be debated and finalised. The current situation where English is the medium of instruction is not benefiting anyone especially the pupils as it has produced more of English language failures rather than mathematics failures. Effort- making organisations like African Languages Lexical Project [ALLEX] and African Research Institute [ALRI] should be capacitated and resourced so that research continues to take place regarding the use of mother tongue as a medium of instruction in the Zimbabwe education system. After everything has been said and done, examinations papers in mathematics can be set , for a start, in all the three languages, that is ,ChiShona, English and IsiNdebele so that learners make a choice of the language they are comfortable with when answering questions.

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Aims and Scope

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Appendix: At the end of the paper

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