SIMULATION AND MODELING METHODOLOGY FOR PHYSICS TEACHERS

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Abstract

Scientific practice involves the application of scientific models, designed to engage students in making and using models and simulations. Scientific models/si of structured knowledge. They are used to organize factual

information into coherent wholes, often by the coordinated use of general laws or principles. Therefore, the structure of
scientific knowledge can be made organizing course content around a small number of basic models
for simulation purposes. The ability to make and use models for simulation depends on the representational tools. Students learn transferable modeling skills by applying given models to a variety of situations to describe, explain, or predict physical events or to design experiments. Theoretical underpinnings methodology of physics teaching is designed especially for physics teachers. Incorporation of the courses into the university physics curriculum needs a consolidated effort from all the stake holders. The simulation and Modeling procedures have evolved over more than a decade from educational research and the experience of exceptional physics teachers.

Introduction

This paper describes theoretical underpinnings methodology of physics teaching designed especially for physics teachers. Incorporation of the courses into the university physics curriculum needs a consolidated effort from all the stake holders. The simulation and Modeling procedures have evolved over more than a decade from educational research and the experience of exceptional physics teachers (Davis, 1999). This paper gives an overview of the pedagogical framework with selective emphasis on a few important issues.

Objectives and Scope

The main purpose of the Modeling is to empower teachers with a robust teaching methodology. This includes the cultivation of teacher abilities to critically analyze any given curriculum materials and organize valuable parts into effective instructional units which make the underlying models explicit– tasks which require a strong pedagogical framework. These abilities are needed to take advantage of accelerating changes in curriculum materials, driven on the one hand by advances in educational research and by new computer technology and software on the other.

Topics have different designs to promote complementary pedagogical objectives. The main objective for instance (on modern physics), is to acquaint teachers with all aspects of the modeling method and develop skill in implementing it. The physical materials and experiments in the curriculum should be simple and quite standard, already available in any reasonably equipped physics classroom (Landau, et al, 2006). In due time the teachers come to understand that the modeling and simulation method can be applied as well to more unusual, complex, and exciting subjects (John, 2006). Since “teachers teach need to include extensive practice in implementing the curriculum as intended for their classes.

The main objective of the design is to give the teachers intensive experience in using what they have learned about the modeling method to construct and evaluate coherent instructional units of their own design (Nick, 2003). They must first learn how to curriculum materials, already available or easily procured for their classes. The teachers are encouraged to identify the underlying models and develop coherent instructional units which engage students in using the models to structure their own understanding. The units developed by the various groups are presented to the entire class for critique, evaluation and discussion of how to organize the units into a complete curriculum.

Instructional materials developed and disseminated are of greater goal in developing a flexible teaching meth especially in the nascent domain of physics education software. This point deserves emphasis, because there is an unfortunate tendency in some quarters to equate educational reform with the creation and distribution of new materials. Modeling aims to promote a community of reform minded teachers who will continue upgrading their own curriculum materials and classroom practice - who are motivated by the vision of a dynamic teacher empowered with special skills, rather than by the static (Brickle,2006).

Where Physics Teaching Fails: Evaluating Instruction

Physicists appreciate the need for instruments which produce accurate and reproducible measurements (Fleming, et al, 2010). He contends that we need operationally specif comparing the effectiveness of different teaching methods. This calls for development and calibration of a battery of instruments for evaluating instruction in a variety of ways. The Force Concept Inventory (FCI) is one such instrument with proven value. The FCI was developed to assess the effectiveness of modern physics courses in meeting a minimal performance standard: to teach students to reliably discriminate between the applicability of scientific con physical situations. The FCI systematically probes student abilities to make such discriminations with respect to six fundamental aspects of the Newtonian force concept.

Including the recent survey done on students' performance in modern physics, we now have FCI data. This data base presents a highly consistent picture, showing that the FCI provides statistically reliable and discriminating measures of minimal performance in modern physics. The results strongly support the following general conclusions:

- Before physics instruction, students hold naive beliefs about modern physics which are incompatible with Newtonian concepts in most respects.
- Such beliefs are a major determinant of student performance in introductory physics.
- Traditional (lecture-demonstration) physics instruction induces only

a small change in the beliefs. This result is largely independent of the instructor’s knowledge, experience and teaching style.

- Much greater changes in student beliefs can be induced with instructional methods derived from educational research.

Understanding Physics

The consequences of this fact are devastating. Unaware that their own ideas about force differ drastically from those of the teacher, most students systematically misunderstand what they hear and read in traditional introductory physics. Consequently, they cannot understand why they fail at problem solving, and they are forced to resort to rote methods for learning meaningless formulas and procedures. The result is frustration, humiliation and student turn off! Fortunately, educational research has shown us how to do better.

Our analysis of the cognitive factors begins with the observation that the student “misconceptions” are framed scientists (Sanborn, 2009) have iden tool of human thought, which we use so frequently and automatically

that we seldom notice the metaphors unless they are called to our attention. Metaphors are used to structure our experience and thereby make it meaningful. In particular, metaphors help us make sense of new experience (target domain) by mapping it onto structure of familiar experience (source domain). (Yasar et al, 2006) argues that our bodily experience, structurally represented by mental image schemas, is the source for our strongest metaphors. For example, we use prepositions to construct a rich system of spatial m are grounded in such schemas. Yasar argues further that the metaphorical use of image schemas is pervasive in our understanding of abstract ideas, including mathematics. Even the idea spatial concept of “following a path

Newtonian Concepts vs. Naive Beliefs

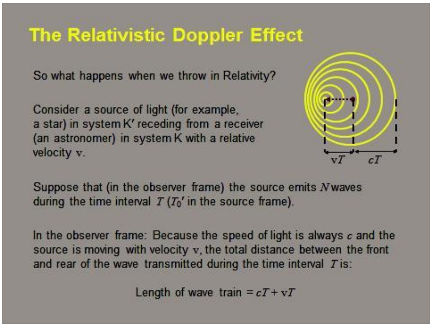

Figure 1: Relativistic Doppler Effect

The percentages are rough estimates of typical post-instruction results for traditional instruction in University (calculus based)Physics at a university. They indicate the fraction of students who fail to consistently discriminate an appropriate use of Newton's Laws from naive alternatives.

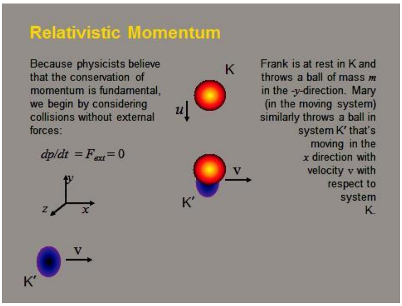

Figure 2: Relativistic Momentum

Appropriate conditions

In other works, misconceptions about modern physics are just cases of misplaced metaphors which will be corrected automatically in response to appropriate experience. The problem of instruction is therefore to arrange

the conditions for such experience. This perspective provides a rationale for one of the most systematic methods for treating misconceptions. It has been suggested that student misconceptions about modern physics are fundamentally different than misconceptions about electricity and magnetism, because students have so much more experience with moving objects. Our present perspective on metaphors suggests otherwise. Students automatically use metaphors to structure experience in any
scientific domain. The case of moder this casually the metaphors are likely to be misplaced even in domains
where they have extensive experience. A major objective of teaching should therefore be to help students

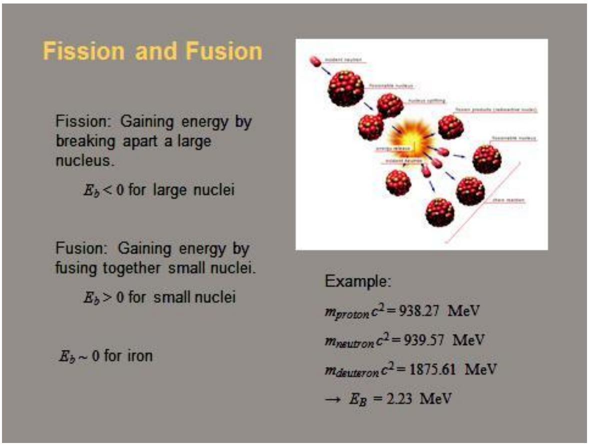

Figure 3: Fission and Fusion

This readjustment of mappings onto their personal image schemas can
be regarded as developing physical intuition. Physics teachers know the
importance of "physical intuition," intuitions (metaphorical mappings) are not the same as their students'.
Therefore, when they express their intuition about force by describing
it as "a push or a pull," they are l association of force with human action, one of the major misconceptions.

Modeling Method

The Modeling Method aims to correct many weaknesses of the traditional lecture demonstration method, including the fragmentation of knowledge, student passivity, and the persistence of naive beliefs about the physical world.

Model-centered instructional objectives

The main aim is to engage students in understanding the physical world
by constructing and using scientif predict, to design and control physical phenomena.
Students are provided
with basic conceptual tools for modeling physical objects and processes, especially mathematical, graphical and diagrammatic representations. This is done so as to familiarize students with a small set of basic models as the content core of physics. Students develop insight into the structure
of scientific knowledge by examini shows how scientific knowledge is evaluating scientific models throu and to develop skill in all aspects of modeling as the procedural core of scientific knowledge (Yasar et al.

Student-centered instructional design

Instruction is organized into modeling cycles which engage students in all phases of model development, evaluation and application in concrete situations - thus promoting an integrated understanding of modeling processes and acquisition of coordinated modeling skills. The teacher sets the stage for student activities, typically with a demonstration and class discussion to establish common understanding of a question to be asked of nature. Then, in small groups, students collaborate in planning and conducting experiments to answer or clarify the question. Students are required to present and justify their conclusions in oral and/or written form, including a formulation of models for the phenomena in question and evaluation of the models by comparison with data. Technical terms and representational tools are introduced by the teacher as they are needed to sharpen models, facilitate modeling activities and improve the quality
of discourse. The teacher is prepa progress and guides student inquiry and discussion in that direction
with “Socratic” questioning and re

taxonomy of typical student misconceptions to be addressed as students are induced to articulate, analyze and justify their personal beliefs (Sanborn, et al, 2009).

Physics can be characterized as a complex network of models interrelated by a system of theoretical principles. For instance when teaching about Rutherford's scattering (fig 4), usi complexity of the all topic. Learners can easily visualize the scattering angle.

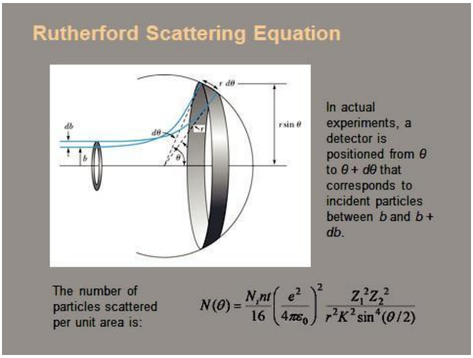

Figure 4: Rutherford Scattering

Models are units of structured knowledge used to represent observable patterns in physical phenomena (Zego and Laquanit, (2005). Accordingly, "physical understanding" is a comple cognitive skills for making and using models. The primary objective of physics teaching should therefore be to develop student modeling skills for making sense of their own physical experience and evaluating information reported by others.

Systematic implementation of the modeling method requires some restructuring of the physics curriculum. To make the structure and content of physics as explicit as possible, course material is organized around a small number of "basic models." Inst intimately familiar with the structure and use of the basic models. That includes using them to construct and analyze more complex models. It provides them with a set of clear examples grounded in personal experience from which they can develop general concepts of models and modeling in physics.

Models

The word “model” is used so frequen especially on the research frontier, that it obviously refers to something
important.

Basic Particle Models in Modern physics.
To capture the concept for the purp
A model (in physics) is a representation of structure in a physical system and/or its properties (Yasar et al.2006). The system may consist of one or more material objects or mass less entities such as light. Unlike a theory, a model refers to an individual system, though that individual may be an exemplar for a whole class of similar things.

The concept of model is predicated holding that the universe is popul properties. Physicists learn about things by investigating their properties

empirically and framing their conclusions in terms of models and theories. They understand physical things through representations in the structure of validated models. Although scie by some philosophers, it is doubtful that physics research makes sense
without it.

To complete the definition of the concepts of “structure” and “repres to illuminate the structural types and the various representations used to

specify them in a model.

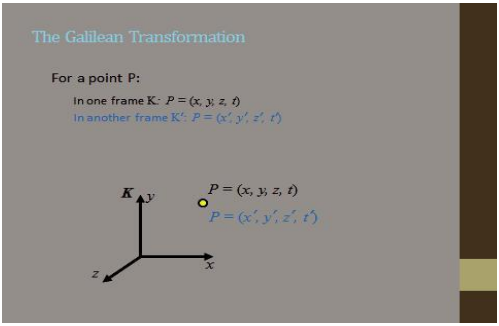

Figure 5: The Galilean Transformation

Examples are given in fig 5. It is representation of structure is distributed across several different
diagrammatic and mathematical representations.

A model is a representation of structure in a physical system and/or its properties. It describes (or specifi internal and external components:

Systemic structure. (b) Geometric structure. (c) Temporal structure. (d) Interaction structure

Every complete model includes a system schema specifying the composition, environment and connections of the system. Though system schemas can be specified verbally, f and/or diagrammatic representations are more informative. Diagrammatic techniques for this purpose have evolved in all the sciences without recognition of their common cognitive function. For example, a standard Bohr diagram (fig 6) is a system s developed elaborate representational tools for constructing molecular system schemas, and in biology, for example, animal digestive and circulatory systems can hardly be understood without diagrams.

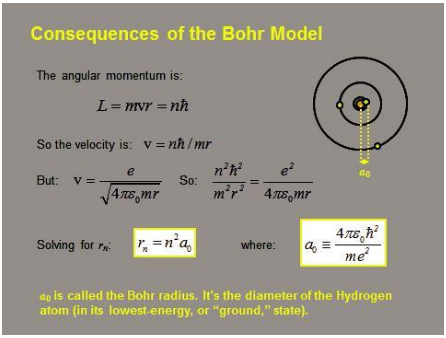

Figure 6: Consequence of the Bohr Model

Strangely enough, diagrams are seldom used to represent system schemas in elementary modern physics, perhaps because the systemic structure of a simple mechanical system is deemed to be so obvious to physicists. It is not so obvious to students. A common source for student failure to solve modern physics problems can be traced to their inability to identify agents of force on an object. To construct a system schema from a given physical situation, or even from an artifici problem," can be deceptively diffic system, identification of relevant information. It is actually a complex skill requiring extensive modeling

to develop to a high level physics shows how an MRI machine used in hospitals for imaging purposes.

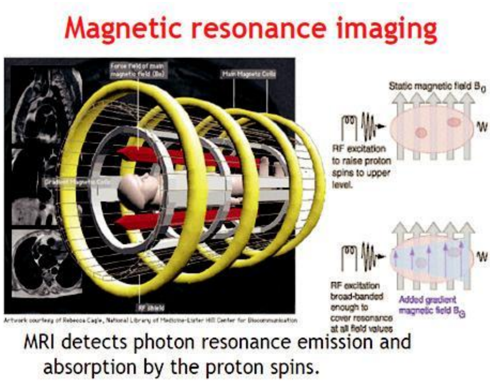

Figure 7: Magnetic Resonance Imaging

System schemas should not be confused with maps, which represent other kinds of information about systems. Nevertheless, its construction may serve as a check that something obvious has not been overlooked, or that everyone is talking about the same system.

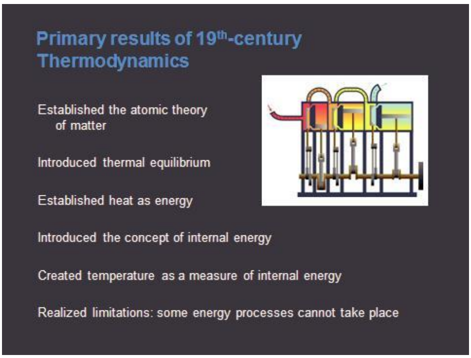

Figure 8: Thermo-dynamical System

For thermodynamics, spatial locatio geometric properties possessed by al

8).

These conclusions can be quantified two traditional courses, a mean normalized gain of 22% was found, with a largest gain of 32%. In contrast, for two courses using non-traditional teaching methods, a mean gain of 52%, with a largest gain of 69% was found. The two means differ by several standard deviations a highly significant result. This shows tha meeting a minimal performance standard for modern physics. Moreover, the failure cannot be attributed to inadequacies of the students, for the data show that alternative methods of instruction can do much better.

Conclusions

One reason for the failure of traditional instruction is that it overlooks the crucial influence of students' the traditional setting naive student beliefs about physics are labeled as misconceptions and are likely to be summarily dismissed as unworthy of consideration. However, the FCI data show that students are not easily

induced to discard their misconceptions in favor of Newtonian concepts. Indeed, physics teachers and educational researchers who are aware of this problem have expended considerable effort in designing and testing teaching methods to deal with speci

Although their outcomes have been decidedly better than the traditional ones, success has been limited and the methods can be criticized as excessively time and labor intensive. Many have concluded that student beliefs are so "deep seated" that them are unavoidable. However, documented success with the modeling method suggests that an indirect treatment of misconceptions is likely to be most efficient and effective the problem will surely require an understanding of the cognitive factors involved.

Reference

Arzu,. T. and Gokhan, G. (2005), Asset and liability management in financial crisis, a journal of ris

P. Davis, "How undergraduate learn computer skills. Results of a survey and focus group", Technical horizo
1999, p69.

R.H. Landau, M.J. Paez And C.C Bordeinm. (2006), A survey of computational physics, 2nd ed., Willeywww.physics-.VCH; oregonstate.edu.

O. Yasar et al. A computational Technology Approach to Education, Computing in science and Eng., vol. 8 nº3, 2006, pp 76-81.

C.D Swanson, Computational Science Survey, tech. report, Krell inst., Nov. 2003., www.krenist.org/services/technology/CSE-Survey.

O.Yasar and R.H. Landau 2003, "Elements of Computational Science and Enginereing Education'. SIAM Rev., vol.45,nº4, , pp. 787-805.

Brickle John (2006). "Multiple Reali philosophy. Htt://plato.stanford.educ/entries/multiple-realizability.

Bastrom Nick, (2003). Are you leaving in a computer simulation? (2003) philosophical quarterly, vol. 53, nº 211 Blackwell publishing, Malden MA.

Fleming, R.W., Barnett-Cowan. M and Bulthof. H.H. (2010). Perceived object stability is effect by the internal representation of gravity. Perception 9(2), 117-123.

Sanborn. A., Mansinghhka. V. and Gri framework for modeling intuitive dynamics in proceedings of 31st
annual conference of the cognitive science society.

Zego. M and Laquanit. F. (2005). Vis of falling objects: areview of evidence for an integral model of
gravity, Journal of Neural Engineering, 2, 5198.

Projection on The Number of Secondary School Students in Kenya in 2015: a survey of nandi north and south districts.

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Abstract

The purpose of this paper was to project the number of students in secondary schools in the year 2015. The study was based in Nandi North and South Districts in Kenya. Descriptive research design was employed and purposive sampling technique used in choosing of the sample size for the study. The objective of the study was to determine the enrolment in schools in the base yea, determine the transition and wastage rate and use the information obtained to forecast to the target year. The study was based on the Manpower Requirement Approach. Data for the study was collected by use
of questionnaires and interview s that the number of students expected to be in secondary schools
in the year 2015 would be 32,545 educational planner, policy makers and the teachers' service
commission should plan for the provision of adequate resources for
the anticipated number of learners.

Introduction

Education plays a key role in the overall development process and has, therefore, come to be regarded as a major ingredient in the transformation of society. Though the positive role that education plays in development had been acknowledged for ages, it was not until the 1960's that studies were undertaken to establish the actual contribution of education to development. In his pioneering work on the contribution of education to economic growth, Schultz (1961), found out that in America, between

1920 and 1957; increase in national outputs was large compared with the increases of land, man-hours and physical reproducible capital, which led him to conclude that investment in human capital was probably the major explanation for the difference. Denison (1962) reinforced Schultz's findings in his studies on the cont growth, which showed that from 1929 to 1958, 23 percent of the 2.93 percentage point growth rate of the America's national product was the direct contribution of more education, (Gravenir, Mukirae & Ouma, 2006).

Republic of Kenya (2005) indicated that there has been an upsurge in enrolment in public primary schools in Kenya following the implementation of the Free Primary Education in January 2003. The enrolment increased from 5.9 million children in 2002 to 7.2 million in 2003.This progressive increase in primary school enrolment in turn affects secondary schools (Mutua and Namaswa, 1992). The increase in enrolment leads to high demand for manpower. Eshiwani (1993) observed that the greatest expansion realized in Kenya's education system has been at the secondary school level, because of the government's emphasis that this level should produce students who will be enrolled at institutions of training and also that it produces middle grade manpower.

According to Mutua and Namaswa (1992), education is considered as a service that is demanded by the public just like any other goods and services. In this view, therefore, education must be provided to all those who want it.

In this sense they noted that:

> Educational planning is a process of forecasting the demand for education and providing sufficient institutions to satisfy that demand. Therefore, it examines the demographic trends through time, in order to estimate the school – age population (Mutua and Namaswa, 1992: p.36).

According to the Daily Nation of 18th December 2007, the education permanent secretary Prof. Karega Mutahi was reported to have said that Free Education to students in public secondary schools was set to start in January 2008. He said that the government was committed to ensure all Kenyan children have access to 14 years of basic education: two in nursery, eight in primary and four at secondary level. Each student would be allocated a total of Ksh. 3,600 per annum and the parents would be expected to meet the cost of boarding and other requirements. The tuition waiver is expected to increase the number of students in secondary schools in Kenya by more than 200,000. Therefore there is need to plan for adequate number of teacher to match the expected increase in the number of students, hence the focus of the current study.

Forecasting students' enrolment is fundamental in provision of quality education if the country is to attain its Millennium Development Goals (MDGs). According to Collymore (2005), the Millennium Declaration in which world leaders (Kenya included) unanimously adopted at their September, 2000, United Nations (UN) Summit, represents a vision for improving the lives of the world's people. The UN agencies and
other international organizations Development Goals (MDGs) and attach and time-bound targets and a set of indicators for tracking progress.

One of the MDGs is that of attaining Universal Primary Education. The government's policy was to achieve UPE by the year 2005 with the overall goal of attaining Education for All (EFA) by 2015. In order to achieve this, forecasting the number of students should be given a priority (Koech, 1999).

According to records at the Distri
North and Nandi South districts there was persistent shortage of teachers and the facilities were inadequate and as a result the Pupil-Teacher Ratios were high and the available facilities for various secondary schools were overstretched, this is as a result of poor planning and the quality of education offered has been affected. Thus there was need to prepare adequately for future enrolment by forecasting students' enrolment in both districts.

This study forecasted the enrolment of students in secondary schools in Nandi North and Nandi South Districts between the years 2008 to 2012. The researcher made use of data fro establish trends which were then u

(2008-2012). Five year forecast was appropriate for this study because the period is enough to allow for the training and recruitment of teachers and the establishment of physical facil

by planning through projection of the anticipated enrolment in
secondary schools.

Objectives

The specific objectives for this stu

- To establish the current number of students enrolled in primary school those were expected to be in secondary schools in both Nandi North and Nandi South Districts in the year 2015.
- To determine the trend of transition rate from primary to secondary schools over the last five (5) yea number of students who will be in secondary school in the year 2015
- To determine the students' wastage rate trend in primary and secondary schools over the last f predict this rate in the districts in the year 2015

Methodology

The research design adopted by the study was the descriptive survey design. The design was appropriate for the study since the research intended to make a specific predicti of students in the secondary school level in the year 2015 in both Nandi
North and Nandi South Districts.

Sample Size and Sampling Techniques

The staff at the District Education
Statistics (C.B.S) formed the target population for the study.

The study adopted purposive sampling technique. Data collection instruments for the study were questionnaire, interview schedule and document analysis.

Summary of Findings

The study set out to forecast the number of students who would be in secondary schools in the year 2015. as per the objectives is given as follows:

Students who sit for the Kenya Ce
(KCPE) and those who enroll in form one has been on the increase although the transition rate generally is still low. In 2002 there were 13,560 students who sat for K.C.P.E and in 2003 the number of students who were admitted to form one in both districts was 4,729 representing a transition rate of 34.87 percent. In 2003, the number of students who did K.C.P.E was 13,906 out of which 5,460 students joined form one in 2004 and the transition rate that year was 39.26 percent. The two districts admitted a total of 5,663 students to form one in 2005 having registered 15,019 candidates for K.C.P.E the previous year and so the transition rate was 37.71 percent. In the year 2005 there were 14,795 students who sat for KCPE in the two districts and a total of 6,768 students were enrolled in form one the subsequent year, this represented a transition rate of 45.75 percent and in 2006, the number of students who were in standard eight in the two districts were 14,406 and 7,270 students joined form one the subsequent year which represented a transition rate of 50.47 percent. This seems to imply that over 50% of the primary school graduates are locked out of the secondary school system. This appears to be in agreement with Republic of Kenya (2004), which observed that the transition rate of students from primary to secondary schools in Kenya is below average and that in 2004; this rate was 43% nationwide.

Wastage Rate in Primary Schools

Wastage in primary schools refers to the students who enrolled in class one but fail to reach class eight after eight years. These students either repeat other classes or they drop out of the school system. Student wastage rate in primary schools varies from year to year. The number of students who enrolled in class one in 1995 was 15, 396 and the number of students who managed to reach class eight in the year 2002 was 13,560. Therefore, the number of students wasted was 1,836 representing 11.92 percent. In 1996, the enrolment in class one was 15,490 and the students who proceed up to class eight in 2003 were 13,906 thus 1,584 students either repeated other classes or dropped out and this number represented 10.23 percent. In the year 1997, 16,783 students enrolled in class one and out of this, 15,019 students managed to sit for K.C.P.E. in the year 2004, in this case therefore, 1,764 students representing 10.51 percent dropped out or repeated other classes. In 1998, there were a total of 16,498 students who were in class one out of which 14, 795 students proceeded up to class eight in 2005. This means 1,703 students, which is equivalent to 10.32 percent, were wasted. Similarly there was a wastage of 1,956 students that is equivalent to 11.95 percent from the 1999 to 2006 cohort, because the number of students who enrolled in class one in 1999 was 16,362 whereas those in class eight in 2006 were 14,406.

The implication of the cohort wastage is that resources will not be properly utilized in these districts because the students who repeat other grades use facilities that are meant for other students whereas those who drop out waste the available resources as they will be underutilized.

Projection of the Wastage Rate in Primary Schools

The wastage rate trend was determine different cohorts. The wastage rate trend therefore stood at 10.99%. This
trend was projected to the year 2015.

Wastage Rate in Secondary Schools

Wastage rate in secondary schools refers to the students who enroll in form one in a particular year but fail to reach form four after four years. A number of these students drop out while others repeat other grades. The students who were in form one in 2000 were expected to be in form four in 2003, those in form one in 2001 were expected to be in form four in 2004 similarly those in form one in 2002 were expected to be in form four in 2005 and those in form one in 2003 were expected in form four in 2006.

The wastage rate for students who were in secondary schools between 2000 and 2003 was 9.30% because 4482 students were enrolled in form one in 2000 and 4065 students were able to go up to form four in 2003 hence, 417 students were lost along the way. In the year 2001, there were a total of 4530 students in form one and the number that managed to reach form four in 2004 was 4098 students therefore, there was a wastage of 9.54 percent as 432 students either dropped out or repeated other grades. In the year 2002, 4593 students joined form one and the number that was able to go up to form four in 2005 was 4203 students giving a wastage rate of 8.50 percent (390 students). In 2003, there were 4729 students in form one and 4368 students managed to reach form four in 2006, thus there was wastage of 7.63 percent (361 students). In the year 2004, there were 5460 students in form one and in 2007 there were 5022 students in form four hence the wastage rate was 8.02 percent (438 students).

The wastage in secondary schools means that there are resources that go into waste because students who repeat some grades end up over utilizing them whereas the dropouts lead the underutilization of resources. Although the number of students enrolled in the primary school level is higher than the enrolment at the secondary school level, there is a higher wastage rate at the primary school level than at the secondary school level.

Projection of the Wastage Rate in Secondary Schools

To project the wastage rate in secondary schools to the year 2015, the information on Table 5 that gives t years was made use of. The average of the percentage wastage rate was
determined at 8.60%. This wastage rate of 8.60% in secondary schools was projected to the year 2015.

Projected Secondary School Enrolment in the year 2015

Out of those students enrolled in class one; there are some who will not proceed up to class eight in the same cohort because of wastage. Out of those who will go up to class eight, a number of them will not proceed to secondary schools, and out of those who will enroll in secondary schools, it is expected that not all of them will go up to form four due to wastage.

The number of children who enrolled in class one in the year 2004 was 15,495 students out of this, 13,792 students are expected to be in class eight in the year 2011 because 1,703 (10.99%) students are expected to have either repeated other grades or dropped out of school. In 2012, the expected enrolment in form one is 8,053 students since 5,739 students are expected to drop out of school after doing KCPE. Out of the form one enrolment, only 7,360 students are expected to go up to form four in the year 2015 as 693 students will have formed wastage at the secondary school level. Class one enrolment in the year 2005 was 16,080 students, but with 10.99% wastage rate, 1,767 students are expected to either repeat or drop out of school before reaching class eight in the year 2012. Therefore, the expected enrolment in class eight is 14,313 out of which 5,956 (41.61%) students are expected to drop out or repeat leaving a total of 8,357 students who are expected to enroll in form one in 2013 and in

2015, the number of students expected to be in form three will be 7,638 students after 719 students forming wastage in secondary school.

Total enrolment in class one in the year 2006 was 17,523 students, 1,926 (10.99%) students are anticipated to repeat or drop out leaving a total of 15,597 students who are expected to do KCPE in the year 2013. The number expected to drop out after the primary school level is 6,490 students and as a result, 9,107 students are expected to be in form one in 2014, subjected to wastage at 8.60%, 783 students will not proceed to form two in the year 2015 hence the form two enrolment will be 8,324 students. In the year 2007, there were 17,745 students in class one, subjected to the wastage rate at 10.99%, 1,950 students are not expected to reach class eight in 2014 leaving a total of 15,795 students to sit for K.C.P.E out of which 6,572 students will drop out, hence in the target year (2015) the expected enrolment in form one will be 9,223 students.

This seems to imply that if the present trend in wastage and transition rates were to continue, then the number expected to enroll in secondary school will be 32, 545 students.

Conclusion

The transition rate from primary to secondary schools was found to be 41.61% which according to Republic of Kenya (2004) is slightly below the national transition rate which stood at 43%. Reasons that were given for the low transition rate included the poverty levels of the people, performance in the Kenya Certificate which is below average, the limited secondary school places, and the retrogressive socio-cultural practices of the residents, orphans, disability and ignorance. The number of students expected to be in secondary schools in the target year is 32,545

A number of students who initially enrolled in the formal school system fail to go through the system in the expected time because they either repeat or drop out. The wastage rate at the primary school level was established at 10.99% whereas wastage at the secondary school level was 8.60%. Causes of wastage were identi the poverty levels of the people, sickness and death, students' academic performance and pregnancy and early marriages.

References

Bogonko, S.N. (1992). *Reflections of Education*. *i*
Nairobi: OUP.

Collymore, Y. (2005). *Gender Equality: New Opportunities for Moving Ahead.* Washington; Population Reference Bureau.

Eshiwani, G. (1993). *Education in Kenya since independence. Nairobi:* East Africa Educational Publishers.

Gravenir, G.S, Mukirae, N. & Ouma, G.W (2006). *The Role of African Universities in the Attainment of the Millennium Development Goals*: Kenyatta University: Nairobi.

Hallack, J. (1969). *The Analysis of Educational costs and Expenditure*. Paris: UNESCO,IIEP series.

Jolly, G. (1967*). Regional Disparities in Educational Development*. Paris UNESCO, IIEP.

Koech D.K. (1999). *Totally Integrated Quality Education & Training. Commission of Enquiry into the Education System in Kenya.* Nairobi: Government Printer.

Kothari, C.R. (1990). *Research Methodology – Methods and Techniques*. New Delhi: Wiswa Praksha.

Luseno, M. A. (1999). *Projecting Enrolment Rates to Determine Gender Equity in Kenyan Secondary Schools.* M.Phil. Thesis, Eldoret: Moi University (Unpublished).

Mehta, A. C. (1994). *Enrolment Projections: Education for All in India .In:* Journal for Educational Planni VIII, Number 1, Pg 37-48. New De

Mutua, R.W. and Namaswa, G. (1992). *Educational Planning*. Nairobi: Educational Research and Publication.

Republic of Kenya (2004). *Report of the National Conference on Education and Training.* Nairobi: Government Printer.

Republic of Kenya (2005). Sessional Paper No. 1 2005: *A Policy Framework for Education, Training and Research*. Nairobi: Government Printer.

Tuition Fees Ready for Schools. (2007, December 18). The Daily Nation. Ngare, P.

UNESCO, (2006). UNESCO Global Education Statistics. htt://stas.uis. unesco.org.

Workload for Secondary School Teacers. (2006, December 4). The Daily Nation.