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Influence of Time on Task on Performance of Students with Hearing Impairment in Physics in Secondary Schools in Western Kenya.

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Abstract: Performance in physics subject in secondary schools, particularly in secondary schools for the Hearing Impaired (HI) has been a matter of great concern in Kenya. Attempts including in-service programmes for science teachers such as Strengthening Mathematics and Science in Secondary Education (SMASSE) have been made to improve the situation but not much tangible fruits have been realized. Surveys have always shown low performance in the subject in most secondary schools for the HI in most parts of the country. This study examined the influence of time on task on performance of students with HI in physics. It adopted concurrent triangulation design and was carried out in selected schools for the HI in Western Kenya. The study sample composed of 4 principals, 7 teachers of physics, 147 students and 4 CSOs. Questionnaires, in-depth interviews, observation schedules and document analysis guide were used for data collection. Physics syllabus was bulky and the time allocated for its study was inadequate for learners with HI due to their unique challenges. It was never fully covered in most schools while others did rushy syllabus coverage denying learners the opportunity for deeper interaction with the content and understanding of the same. The study recommended that physics syllabus be shortened and adapted to suit the unique needs of learners with HI.

Keywords: Hearing impairment, Time on task, Performance, Physics.

INTRODUCTION

Time on task as an aspect of curriculum is an essential component of instructional decision-making and subject area prioritization. It affects how much students are exposed to specific content and skills. Adoyo (2004) highlights time on task as one of the two most important variables in the education of the hearing impaired students.

Hearing impairment is not only about hearing loss but it also opens up the individuals to such challenges as learning problems that result in reduced academic achievement due to language deficit, American Speech-Language-Hearing Association (ASHA, 2015) and the difference in academic achievement between learners with HI and that of learners without HI usually widens as they progress through school (Roald & Mikalsen, 2000). Research studies have established that HI does not affect an individual's intellectual capacity to learn, (Chimedza and Peterson, 2003). However it slows down their process of reaching full potential when early stimulation and training in communication is not provided, (Moores 1996). Learners with HI have been faced with a great difficulty following the same curriculum used by their hearing peers. This can be attributed to the fact that they have limited opportunities to fully interact with their environment as opposed to their hearing peers, Marschark, (1993). Luckner & Bowen, (2006) assert that learners with HI may be in a position to master the academic content but their ability to demonstrate academic performance may be compromised due to delays in developing communication, language, reading and writing skills. Consequently, this leads to barriers of inadequate linguistic abilities and socio-cultural knowledge. According to Luft (2016), the cognitive constructs necessary to comprehend, manipulate, and respond to curricular content depend upon linguistic abilities to describe comparisons, sequences, and causation. As a result, learners with HI may be greatly disadvantaged due to their inadequate language development. Consequently, this may make them unable to compete favorably with their hearing peers, possibly the disparity in their performances.

This calls for substantially greater effort by teachers to help them attain outcomes similar to their hearing peers. Much time is therefore required in engaging their cognitive abilities in ways that reduce the barriers and enable them fully comprehend and participate in the activities of the same curriculum followed by their peers owing to the long physics syllabus. Other scholars have presented time as an indicator of opportunity to learn. For instance, Berliner, (1990) points out that the greater the amount of instructional time teachers allocate toward a specific subject, the greater the content exposure and opportunity to engage learners. Confirming Berliner's sentiments, Farbman and Kaplan, (2005) assert that with additional time, learning is less rushed and teachers have the flexibility that enables them to allow students to spend more time on task, which is one of the most basic predictors of student performance. It also enables teachers delve more deeply into the subject matter, because they are no longer pressed by the clock to squeeze as much

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content as possible into a single lesson, the researchers add.

Statement of the Problem

Researchers have indicated that learners with HI have limited access to their environment compared to their hearing peers, this leads to barriers of inadequate linguistic abilities and socio-cultural knowledge. Consequently their process of reaching full potential is slowed down. This calls for substantially greater effort by teachers to help them attain outcomes similar to their hearing peers. Much time is therefore required in engaging their cognitive abilities in ways that reduce the barriers and enable them fully comprehend and participate in the activities of the same curriculum. While there is evidence that the ministry added an extra 30minutes to learners with special needs during examinations, nothing has been done relating to the length of the physic curriculum content in relation to the time available to cover it owing to the unique and different needs of learners with HI. This study investigated the influence time on task on performance of students with HI in physics in secondary schools in Western Kenya Region.

Purpose of the Study

The purpose of this study was to examine the influence of time on task on performance of students with Hearing Impairment in physics in secondary schools in Western Kenya.

Objective of the Study

The objective of this study was to establish the influence of time on task on performance of students with Hearing Impairment in physics.

Research Question

The study sought to answer the following research question: To what extent does time on task influence the performance of students with Hearing Impairment in physics?

Significance of the Study

The findings of this study would be of significance to various education stakeholders including the Kenya Institute of Curriculum Development (KICD) to enable them review the physics curriculum and instructional materials and adapt it to suit the unique needs of the learners with hearing impairments.

Scope of the Study

The study was confined only to secondary schools for the hearing impaired in Western Kenya. It only focused on influence of time on task on performance of students with HI in physics and the target population was CSOs, principals, teachers and the learners with hearing impairments in the sampled schools. The instruments for data collection were interview schedules, observations checklist, questionnaires and document analysis guide.

LITERATURE REVIEW

Influence of Time on Task on Performance of Students with Hearing Impairment in Physics

In a study to seek observations and views based on the experiences they had as learners with HI in the learning of science in Norway, five teachers with HI were interviewed by a researcher; physics was their major subject (Ingvild, 2002). They observed that their curriculum was reduced and changed. One of the respondents also pointed out the struggle he experienced by his own students in his station of trying to cover the same curriculum as the other schools and as expected of them but limited time was his major challenge. Physics regular curriculum is long and some concepts are also very demanding. A lot of time is therefore required coupled with hard work for learners to understand. Many teachers, even in the regular schools are always under pressure because of shortage of time and sometimes may end up not carrying out the number of experiments required due to limited opportunities. HI learners cannot read signs and write/work simultaneously as their hearing peers can do. This clearly implies that with the longer regular curriculum content for physics, much time may be needed in order for it to be effectively covered. Although the above literature was done in physics, the researcher relied on data from interviews only while the current study applied multiple data collection instruments for verification hence improving the validity of the outcomes. Besides, the respondents in the reviewed study were only teachers while the current study comprised of learners with HI, principals and CSOs in addition to teachers.

Nickerson and Kritsonis, (2006) did an analysis of the factors that impact academic achievement among the Asian America, African America, and Hispanic students in America. Various statistics indicated that Asian Americans achieved very high as compared to their counterparts (also referred to as the minority students). One outstanding factor leading to the vast disparity in academic achievement between the mentioned groups of students was time spent on task. The study

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revealed that the Asian Americans spent more time on task which impacted positively on their academic achievement. While this study was conducted on mathematics and other sciences, the current study narrowed down to physics as a subject. Further, the current study involved learners with HI in special secondary schools for the HI as opposed to Nickerson and Kritsonis's study which involved regular learners.

In America, another study was carried out on the effects of increased learning time on student academic and nonacademic outcomes (Kidron and Lindsay, 2014). In this study, meta-analysis was used to summarize the findings across 30 studies, where the effects of all the relevant studies were combined to arrive at a single estimate of the size of the effect. The outcome of the study indicated a positive relationship between time on task and academic achievement. The researchers affirm that some students lack the vital fundamental skills and because of this they may require several weeks of instruction to deliver a supplemental curriculum. Gersten, Chard, Jayanthi, Baker, Morphy & Flojo, 2009) in support to this add that increased learning time provide an opportunity to offer supplemental instruction to enable the struggling students to catch up and to match instruction with students learning styles. The study further revealed that increased learning time improved literacy and math achievement when the instruction was led by certified teachers although the effects were small. It also improved literacy achievement of students performing below standards and the socio-emotional skills of learners with Attention Deficit and Hyperactivity Disorder (ADHD). The reports analyzed in the above study were based primarily on the outcomes of elementary and middle school colleges with only one study reporting on an effect on high school students hence the move by the researcher to conduct a study on the influence of time on task on HI learners' performance in physics in secondary schools.

Kenyan curriculum may look far different from the American curricula than it actually is. Increased time spent on task beyond the traditional school day and year in America is made easier by such programs as summer schools; study programs held during the summer for supplementary and remedial study, expanded learning time schools; enrichment programs that take place after school, before school or during weekends, year round schools; schools that operate year round and replace the long summer recess with shorter breaks between school sessions, among other programs which are funded by various education departments, Kidron and Lindsay, (2014). However, in Kenya similar programs could be the holiday tuitions, morning and evening and weekend remedial lessons to enable the students to catch up, which are currently illegalized by the ministry of education. Increased time on task for the learners with hearing impairment can be achieved by modifying the longer regular physics curriculum so that what needs to be covered can be done within the limited time available (Task Force on Appraisal of Special Needs Education - GoK, 2003), bearing in mind the unique and different needs of learners with disabilities. In contrast, the current study involved students with HI hence filling the gap owing to their unique needs.

In Africa not much has been done relating to influence of time on task on students' performance. In fact, no known research study has been documented on how time on task influences performance of learners with HI in physics. The current study therefore filled this knowledge gap.

Maina, Adoyo and Indoshi, (2011) investigated the curriculum factors influencing performance of students with HI in mathematics in selected districts in Kenya. 125 respondents from 4 secondary schools for the HI were sampled for the study. Descriptive survey design was employed in this study with data being collected through questionnaires, observations and interviews. The study established that 90% of teachers never covered the syllabus on time and the reasons quoted include; mathematics syllabus too wide for learners with HI, the process of teaching slowed down by use of sign language for communication, among others. The findings in the above study pointed to a major observation that the instructional time allocated for the study of mathematics was not enough for students with HI given the wide syllabus and the varied needs of the learners. It therefore attributed low performance of mathematics to insufficient time on task. While this study focused on time on task in relation to mathematics, the current study focused on physics. Besides, researcher employed concurrent triangulation design as opposed to the descriptive survey design used in the reviewed literature in order to provide a more complete and comprehensive understanding of the research problem.

Omutsani, (2012) conducted a study on factors affecting KCPE performance of learners with HI in special schools in selected counties in Kenya. One

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of the objectives in that study was to establish syllabus coverage for learners with HI. The respondents reported that it was impossible to cover the syllabus as stipulated by the Ministry of Education. A number of reasons were floated to this effect by the respondents who were teachers and head teachers, which included: the curriculum content being too wide, the curriculum not adopted to suit the educational needs of learners with HI and the stipulated time being too short to be able to cover the content at hand. The study revealed that time on task influences academic performance. The study discussed sought to document the extent to which curriculum content in all subjects affect the overall outcome in KCPE while the current study being specific narrowed down to the influence of time on task on performance of physics subject. Furthermore primary school curriculum differs from that of secondary school hence the researcher in the current study filled the gap by involving learners in secondary schools.

RESEARCH METHODOLOGY

Research Approach

The study adopted the mixed methods research approach. This is where the researcher incorporates methods of collecting or analyzing data from the quantitative and qualitative research approaches in a single research study (Johnson and Onwuegbuzie, 2004).

Research Design

The study adopted the concurrent triangulation design of mixed methods research approach. In this design, the researcher converges or merges quantitative and qualitative data in order to provide a comprehensive analysis of the research problem (Creswell, 2009). The design was suitable for this study as it helped the researcher develop a more complete understanding of the research problem, and to bring together the differing strengths and non-overlapping weaknesses of quantitative methods with those of qualitative methods (Creswell, 2014 and Plastow, 2016). The researcher collected both qualitative and quantitative data in the same phase of the research process, analyzed the two components independently, and interpreted the results together.

Location of the Study

The study was carried out in four selected secondary schools for the HI from different counties in Western Kenya Region

Target Population

This study targeted four special secondary schools for the HI in the region which consisted of 816 students, 59 teachers, 4 principals and 4 curriculum support officers (CSO) in charge of SNE from the four sub-counties in which the schools for the HI are located. Therefore, the target population in this study was 883.

Sampling Technique and Sample Size

The sample constituted of 4 principals, 4 CSOs, 7 teachers and 147 students totaling to 162 respondents. Purposive sampling technique was used to select the four special schools, teachers and students while the principals and CSOs were selected using saturated sampling technique.

Research Instruments

The instruments used for data collection included observation checklist, questionnaires, interview schedules, and document analysis guide.

Reliability

Cronbach's alpha was used to check reliability (consistency) of the questionnaire. The coefficient alpha value was .976 which indicates a high level of internal consistency (Davidshofer and Murphy, 2005). In qualitative research, reliability was ensured by trustworthiness of the instruments in terms of credibility, transferability, dependability and conformability.

Data Analysis

Quantitative data was analyzed through the statistical package for social sciences (SPSS version 22) and presented using descriptive statistics such as charts and tables showing frequencies and percentages while qualitative data was organized and analyzed using thematic framework adopted from Braun and Clarke, (2006).

Ethical Considerations

The study was guided by universally accepted ethical considerations. Participants were given full information about the nature and purpose of research study and the implications of their participation. Further, there were informed consents of various participants as well as confidentiality for any information offered

RESULTS AND DISCUSSIONS

The study investigated the extent to which time on task influences the performance of learners with HI in physics. The themes that emerged were, but not limited to unique challenges encountered in teaching learners with HI as opposed to their

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hearing peers, length of physics syllabus in relation to time of study and extent to which the syllabus was covered.

Unique Challenges in Teaching Learners with HI as Opposed to their Hearing Peers

Participants highlighted a number of challenges in relation to time that they encounter in teaching learners with hearing impairment. For instance, a statement captured from one principal stated that:

Doing three things at ago copying on the board, signing and speaking as well. Remember there is no dictation as is the case in regular. The 40minutes allocated is not enough to cover much work. (PA)

Another principal said:

Aahhh most of these HI learners learn best under visual learning/ visual teaching and you find that when you go teaching lecture method they may not be able to understand and the other thing is that their memory lifespan is sooo short, then also the issue of language. Most of them use KSL and you get that most of subjects are English so that poses a challenge for them to be able to interpret and internalize what is taught. (PD)

Further, one principal who had an experience of teaching both hearing and learners with HI in the same context noted:

The school is inclusive hence we can compare… the class of hearing impaired is a little been behind compared to the hearing class. The teacher finds it easy to explain a concept and move with the hearing learners than HI. The same teacher teaches the same thing at a slower pace to the HI and the reason is simple: you don't have to move to the next thing if you think they haven't conceptualized so the time you think they have now conceptualized, the regular have moved ahead.(PC)

One teacher stated:

Another big challenge is common terms in different subjects. For instance the word 'mean' in both mathematics and English. Two words with different meanings and signs. It takes time to get a learner distinguish the two. Explaining the term in its context is quite a big deal. (TA2)

Another teacher added:

If a learner cannot recall what he/she learnt in F1, it becomes very hard for him/her to apply the same knowledge in answering questions. For instance when solving a problem in class involving topic learnt in the previous class, it becomes very hard coz he/she can't recall. (TC)

One of the CSOs on the other hand pointed out inadequate human resource as a recipe for poor performance. He said:

To me inadequate human resource is a challenge! Physics is a practical subject and some of our learners have multiple disabilities that will require more than one person in a class to attend to them in a manner that can yield better results. (CSO1)

Another CSO had this comment:

Challenges in teaching these learners are immense, if our teachers go for passion when selecting SNE then curriculum delivery can be very smooth. So you find very many special schools doing poorly because most teachers are going in for grade and not value addition for the students. (CSO4)

These findings seem to concur with ASHA (2015) whose study revealed that hearing impairment is not only about hearing loss but it also opens up the individuals to such challenges as learning problems that result in reduced academic achievement due to language deficit. Some of the challenges that emerged from this study include: doing three things at ago copying on the board, signing and speaking as well which affects the pace of syllabus coverage, short memory lifespan hence the learners have difficulty recalling what is learnt in the previous class or lesson. The participants also pointed out that learners take longer time to comprehend what is taught, limited or lack of definite signs for some terms in physics leading to much interference when locally made signs are to be used, and the fact that most subjects are presented in English while the learners are KSL users which poses a great challenge to learners when it comes to internalization and interpretation of what is taught, among other challenges. Chimedza and Peterson (2003) found that these challenges do not affect the learners' intellectual capacity to learn. However, they slow down their process of reaching full potential (Moores, 1996). Thus, poor performance in physics among learners with HI was attributed to limited time on task owing to their unique challenges as opposed to the hearing peers.

Length of Physics Syllabus in Relation to Time of Study

Most of the participants felt that physics syllabus is generally bulky and covering it within the stipulated time was difficult owing to the unique

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challenges encountered in teaching learners with HI. These have a great bearing on the pace of coverage of the syllabus. The response from one teacher was as follows:

I think it is bulky. If you don't have extra time to be with the students, most of the times we're unable to complete the syllabus and it overlaps. You can't combine subtopics for our students_ just one at a time. If you combine they either get confused or switch off from it. In fact, a subtopic can even be repeated. (TB)

Another teacher added:
Yes… sometimes you have to speed up in order to cover much although at the back of your mind you just know they are getting nothing…but you have to cover it anyway to take the blame off your shoulder! This negatively affects their academic performance since they don't understand. (TC)

When asked the same question, another teacher had this to say:
Form one and three syllabus is very bulky and definitely that means I'll have to carry forward some work to the next class and if I have to do revision then I'll have to move very fast to spare some time for revision, which is not the case most of the times. (TA2)

One teacher on the other hand had this to add:
Form 1 syllabus is very long, form 2 is light but form 3 is very long with calculations in every topic and so you have to take a long time. These learners do graphs in mathematics, when they come to physics it appears like they have never done it before. What can you do?? (TA1)

Form the interviews, it was evidenced that physics syllabus was wide hence covering the content within the stipulated time is a challenge to teachers in both regular and special schools. The problem is even worsened when teaching learners with HI due to the unique challenges as has been discussed earlier. Wider curriculum content implies that the time on task is therefore reduced as the teacher will be under pressure to complete the syllabus. This finding is in agreement with the conclusion by Ingvild (2002) and GoK (2003) that the longer regular physics curriculum needs to be modified and reduced so that what needs to be covered can be done within the limited time available.

Extent of Syllabus Coverage
The students were asked to indicate if the physics syllabus was fully covered. Their responses were as shown in table 1.

Table 1: Syllabus coverage (N=140)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	50	35.7	35.7	35.7
	No	90	64.3	64.3	100.0
	Total	140	100.0	100.0	

50 (35.7%) of the students indicated that physics syllabus had been covered while 90 (64.3%) of them indicated that physics syllabus was not fully covered. This shows that majority of the students had a feeling that physics syllabus was not well adequately covered within the schools studied.

When asked to quantify the number of topics that were uncovered, the responses summarized as in table 2.

Table 2: No of topics uncovered (N=90)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	One topic	36	40	40	40
	Two and above	54	60	60	100
	Total	90	100	100	

36 (40%) of the students questioned indicated that one topic was uncovered by the time they were moving to the next class while 54 (60%) showed that two and above topics were uncovered. It can be concluded that there were a number topics that were uncovered in physics within the schools studied at the time the learners were transiting to the next class as evidenced from the table.

Interviews were done with principals, teachers and CSOs all participants from the sampled schools indicated that physics syllabus is never fully covered in their schools. This emerged in statements such as:

If you were to go literally to cover syllabus within the stipulated time, I can emphatically say that the deaf cannot cover the syllabus within that time..!

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You cannot…! It needs almost a year. If there is four years, they need 5years to cover what the regular cover in 4years. (PC)

One principal in response to the question said that:
It is quite an impossibility to complete the syllabus unless you want to complete it alone as a teacher, but with the students it is impossible! In fact syllabus for the HI is one year behind the regular, that is, when the regular students are doing form four work, the HI learners are doing form three work. Syllabus is never completed!! (PD)

Another principal had this to say when approached with same question:
No*! No! No..! We have never completed the syllabus in time… (PB)*

The teachers interviewed were in total agreement with the principals' take on syllabus coverage. Their responses were as follows:
Doing three things at a time….talk, write and sign. You cannot move at the same pace with somebody teaching in regular school. In regular they write the key points where the students may have spelling problems, but mostly dictate so they move faster. In HI, I have to sign, talk and write on the chalkboard as a result a smaller content is covered per time. While those in regular schools clear everything, those in HI cover just a portion if handling the same sub topic meaning I have to go back to the same thing in the next lesson. Hence the method of teaching interferes with the speed of syllabus coverage. Syllabus coverage is therefore a serious challenge! (TA1)

Another teacher added:
In most cases, a class work is carried to the next class. This means that by the time the students are in form four, probably they're still doing form three work. When you struggle to move fast and it cannot work owing to the nature of our learners, you think of other strategies like topical revision. (TD)

In response to the question, one teacher narrated her experience with the previous candidate class:
I remember the last topic I did with them was mains electricity (topic 6 out of 10) and again the remaining were taxing and demanding na hata kusoma the vernier scale which is basic physics hajui….so tutaendelea kusoma what you can't manage within a short time..!!? Then I opted for much of practical work. (TA2)

The CSOs on the other hand confirmed the sentiments by the other respondents when asked whether syllabus was fully covered. One of them said:
No no! It is quite a big challenge…but achievable depending on the teachers' creativity. If they embrace remedial times then it is achievable. (CSO1)

It emerged that physics syllabus was never fully covered within the sampled schools. The respondents expressed the fact that the timing for its completion was a target unachievable especially for learners with HI. This is because teaching and learning process is slowed down by the use of sign language (Maina, Indoshi and Adoyo, 2011). This implies that learners are tested on content that is not covered. Lower performance in physics among learners with HI could therefore be attributed to limited time on task.

CONCLUSION

The results from questionnaires and interviews indicate that syllabus was not adequately covered in most of the schools. During lesson observations in the various schools, it was further evidenced that syllabus coverage was a major issue. For instance, a form three class was still in the second topic out of ten topics in the last quarter of third term. Elsewhere, a form two class was still covering form one work. This could imply that the time allocated for studying physics is inadequate for learners with HI due to to their unique challenges as enlisted by most of the participants. This finding is in agreement with Adoyo (2007) who observed that the timing for completion of the curriculum is unrealistic for students with HI as the teaching and learning process is slowed down due to the process involved. Teachers are therefore forced to either rush with the coverage irrespective of whether or not the students understand, or opt for alternative methods like topical revision instead of deeper content teaching as one teacher earlier pointed out during an interview. As Farbman, Goldberg & Miller (2014), Gromada & Shewbridge (2016) indicated, if time is adequate, students would have more time for learning, more time on tasks and less rushed lessons, on the contrary learners with HI suffer a great deal. The findings of the current study reveal that they are denied the opportunity for deeper interaction with the content and consequently the understanding of the same due to rushy syllabus coverage and the worst of all, failure to fully cover the syllabus leading to learners being tested on what they have not learnt. This negatively affects their performance in the subject hence the repeated

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lower performance observed in the schools. It can therefore be concluded that time on task influences the performance of students in the subject.

CONCLUSION

Summary of Findings

The study sought to establish the extent to which time on task influences the performance of students with HI in physics. It emerged that physics syllabus was not adequately covered in all the sampled schools due to limited time. In some schools teachers resorted to alternative means like topical revision in form four when they could not complete the syllabus, others brushed over the syllabus without considering whether or not the students understood to avoid the blame of not covering everything, while others taught only what they could manage leaving out the remaining topics.

Conclusions of the Study

Time on task was found to influence the performance of learners with HI in physics. The greater the time allocated to a specific content, the greater the exposure and opportunity to engage learners in the same. This leads to better understanding and higher retention, and consequently better performance.

RECOMMENDATIONS

The study recommended that the bulky regular physics syllabus be shortened and simplified to increase time on task. Such topics that don't go well with the deaf like sound be scrapped off the syllabus.

Suggestions for Further Research

a) A study on factors other than time on task affecting performance of learners with HI in physics be carried out.
b) A study be done on influence of time on task on performance of learners with HI in other subjects.

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