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Interactive whiteboard for primary schools in Mauritius: An effective tool or just another trend?

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ABSTRACT

Mauritius is among the few African countries where the interactive whiteboard has been implemented in all primary schools. The interactive whiteboard is an important tool in the classroom as it changes the mode of instruction. Many researches have been carried out in many countries to investigate the effectiveness of the interactive whiteboard. This research is based on a feasibility study to determine teachers' and learners' perceptions of the potential benefits and drawbacks of using interactive whiteboards in their teaching and learning environments. In this research project, an educational resource was designed and mounted using XERTE which is an Open Source Authoring tool, to test whether interactive whiteboard can improve learning in schools. Additionally, a survey was carried out among primary school teachers to gather feedbacks on the interactive whiteboard. The outcome showed that using the interactive whiteboard does not necessarily mean getting better results in learners' assessments. Yet learners showed better engagement and enjoyment during the lessons. The survey revealed that few teachers were actually using the digital board. It is still unclear whether these teachers are making effective use of the interactive whiteboard or not. The survey also concluded that most teachers agreed that the interactive whiteboard was an effective tool as it benefited to all types of learners.

Keywords: *interactive whiteboard, educational learning tool, primary schools, XERTE, authoring tool*

INTRODUCTION

It is not new but the sporadic development in the technological field and the advent of computers have revolutionised the human existence. Yet it has been noted that the education sector has been slow to adopt technological advancement. Morgan (2008) rightly stated that this lack of interest may be attributed to teacher fears, but may also stem from deep-rooted teacher beliefs that traditional instructional methodologies have withstood the test of time, a "go with what you know" mentality. Today, however technology is everywhere and we are living in an information and digital age. Children use technology since their early age in the form of television, mobile phones and internet through social networking systems to be in continuous touch with the world and be updated constantly. But at school, these students are cut off from their sophisticated and digitalised world and projected in their teacher's traditional way of teachings. It is imperative to bring about positive change in the teaching methods in classes that will fill the gap as the children of today do not fit in such environment. Educators need to incorporate various technologies into their educational toolkits to reach students and to remain relevant in an ever-changing society. Radio, television, Video CD, Digital Video Disc (DVD), computers and now the latest, the Interactive Whiteboards (IWB) are among the technological tools introduced in schools for the enhancement of teaching and learning.

In a study carried out by Beauchamp (2004) in the UK whereby he proposed a framework and developmental model for schools, which can be used to assess and guide teacher progress towards using the IWB effectively. Focuses were placed on interactive teaching styles, alongside the gradual development of specific ICT skills of the teacher. Slay et al. (2007) reported on a case study that was carried out based on 3 government schools in South Africa and highlighted learners' and teachers' enthusiasm about the "big screen" and the multimedia that were being used. However the authors noted that many of the teachers and learners were not ICT literate as well as the cost of technology in South Africa was high. These elements hindered the learning process. From a study carried out in Spain, Coyle et al. (2010) mentioned that IWBs offer multiple possibilities that require specific knowledge of how best to exploit their versatility in the classroom. They further mentioned that IWB does not have the potential for making on the quality of classroom interaction. Therefore they requested that training should also focus on developing teachers' interaction skills.

Smith et al. (2005) carried out an intensive review on the introduction of interactive whiteboards as a pedagogical tool in schools. The evaluation focused mainly on the impact of IWB in class interaction, teacher perceptions and on pupils' attainment, progress and attitudes. Two categories were discussed and analysed which were: the IWB as a tool to enhance learning and as a tool to support teaching. The report mentioned that teachers found the IWB as being a flexible and versatile teaching tool and which was used among different age groups and under different settings. The IWB allowed the use of multimedia such as sound, video, images as well as interactive features such as real time movement in rotating an object or interactive games. Teachers like the touch sensitive nature of the IWB as it help to deliver a more professional and effective presentation. Furthermore, it eliminates disruption, improves visibility and reduces repetitions as everything written on the IWB can be saved and reviewed again. The report also mentioned that students enjoyed the aspect of physical interacting with the board however this is not so common for teenagers who are not eager to leave their seats. The IWB motivates the learners by making the lesson more enjoyable and interesting, resulting in improved attention and behaviour and because of the multi-sensory input, all types of learning styles do benefit.

There are many problems associated with using the IWB and Smith et al. (2005) pointed out some of the common problems are related mainly with training, support and practicalities. For examples, lack of trainings and inadequate IT supports can impede and frustrate teachers. Other issues addressed are: the position of the IWB within a classroom, the day light reflection on the IWB, dust on the projector or the board itself and shadow of the user on the IWB can hinder and affect learning.

In Mauritius, the implementation of technology is in its early stages and so initial impressions and the Hawthorne effect (Sonnenfeld, 1985) may be contributing to current practice. In 2011, all primary schools in Mauritius were equipped with at least one IWB. This was made possible thanks to the Sankoré project, 2008. The Sankoré project came into being following the Franco-British Summit held in March 2008, which aimed to help Africa to achieve the Education for All (EFA) goals through digital empowerment. Mauritius is among the African countries where IWB is being implemented. It targets to bring qualitative changes in the classroom and to bring fundamental change to the current teaching and learning process. Phase one of the Sankoré project is now completed and it is currently implementing phase two.

OBJECTIVE

The objective of this study was to find out whether the use of IWBs in primary schools can promote and improve learning and to establish how far teachers were at ease with this new digital tool.

Two methods were conducted and analysed:

- Mounting an educational resource using XERTE (open source tool) to test whether IWB can improve learning in schools.

- A survey was carried out among primary school teachers to gather information on the IWB and provided information on the following:
  - Analyse how far teachers were using the IWB for their teaching.
  - Determine whether teachers were ready to use the IWB.
  - Identify the causes for teachers' resistance in using the IWB if there were any.
  - Determine whether teachers were using the IWB as an effective tool or just like an ordinary whiteboard.

RESEARCH METHODS

The research was divided into two parts. The first part was carried out in 3 different classes from 2 different schools to find out whether students learning improved when the IWB was used. An Educational Resource (ER) was developed based on the 'Solar System' and was used as a teaching tool to teach the test groups which consisted of 40 pupils. Two groups of learners were used in this experiment whereby one group was taught using the traditional methods and the other group was taught via the ER through the IWB. A pre-test and a post-test were carried out with both groups.

The second part was based on a survey. The survey in the form of a questionnaire was distributed to 125 primary school teachers in 13 schools across the country, then later collected back and analyse using data to find information on how teachers were using the IWB in their teaching as well as their views on the innovative technology were gathered.

Criteria for selecting the teaching topic

The following criteria were taken on board when selecting the topic:

- The topic should be something that is difficult to teach using the traditional chalk and talk method.

- The concepts involved should be abstract for the pupils but at the same time it should be of interest to them.

The selected subject was Science and the topic was based on the 'Solar System', which is part of the Standard V Primary Schools syllabus. The ER would be based on the Solar System and would be used as a teaching tool to teach the test groups.

The Schools and the Test Groups

PGS is a two stream school, found near the town of Quatre Bornes, with a population of nearly 550 pupils who study in mixed ability classes. The final and main examinations in primary schools are carried out at the end of standard 6 and known as the Certificate of Primary Education (CPE). The pass rate of the CPE examinations for the past years has been around 60-70%. FEFGS is a one stream school found in the West of Mauritius and has a population of about 200 pupils. The pass rate at CPE is around 35-40 %. The targeted age groups are between 09 to 10 years old pupils, Table 1.

Table 1: *Details that would be taken into consideration to develop the ER*

Schools	Description of Classes	Description of Groups	Details
1. PGS	Class 1A Class 1B	• 9 to 10 years old • Mixed abilities	• Urban Area • Pass Rate at CPE= 60-70%
2. FEFGS	Class 2C	• 9 to 10 years old • Mixed abilities	• Rural Area • Pass Rate at CPE= 35-40%

Two classes of standard 5 from PGS and one class of standard 5 from FEFGS were used to conduct the experiments. PGS was referred to as school '1' and the two standard 5 classes were denoted as class A and B. FEFGS was named school '2' and its standard 5 class was named class C. Each class was further divided into two groups each constituting the same number of pupils of high, average and low abilities. Each group was named as follows:

- In class 1A = Red and Blue
- In class 1B = Yellow and Green
- In Class 2C = Pink and Grey

Whereby Red, Yellow and Pink were the test groups where students were taught the lessons via the ER and IWB (Table 2). The other groups were taught using the traditional methods of teaching. A pre-test and a post-test were carried out with all 3 groups, i.e. 1A, 1B and 2C.

Groups Blue, Green and Grey were taught the same topic but using the traditional method. Here the same concepts were taught and stressed upon. Pictures and drawings were used to help understanding. The same oral questions were asked but more demonstrations were carried out to clarify explanations. Pupils were asked to act as Sun, Moon and Earth and move in an orbit. The same amount of time was devoted, i.e. 3 x 50 minutes.

Furthermore, all pupils had to answer a questionnaire containing 10 questions (pre-test) before starting the lessons. The aim was to find out how much pupils already knew about the subject that is, testing their prior knowledge. After carrying out the lessons with both the control and the test groups, a second questionnaire was set. The questionnaire contained 18 questions (post-test) among which were found the 10 pre-test questions in a jumbled manner and some of them had even been rephrased, Table 2.

Table 2: *Details of lesson plan for the groups using ER and IWB (Groups Red, Yellow and Pink)*

Day	Activities	Descriptions	Remarks
1	Pre-test	Written test	10 questions – test carried out at the start of the lessons
2, 3, 4	Lessons	Taught the topic 'our Solar System' using IWB and the ER	Duration of 50 minutes for each session. Students participated in the interactive activities available in the ER
5	Post-test	Written test	18 questions - test carried out at the end of the lessons

Designing and developing the Educational Resource (ER)

One major factor which was considered before designing instructional activities was the Instructional design models as they provide guidelines or frameworks to organize and structure the process of creating instructional activities. The Kemp's Instructional Design Model (Morrisson et al., 2004) and the Gagne's Nine Events of Instruction (Clark, 2004) are the two models which are most appropriate to guide in the creation of instructional activities for the ER.

The Open Source Authoring tool 'XERTE', developed at the University of Nottingham, was used to develop the ER (The Xerte Project, 2008). XERTE is a flexible template for creating interactive learning objects. It has multiple features which facilitate incorporating text, images, videos, sounds and other media. Navigation from page to page is very easy. The XERTE contains a variety of embedded features, which provides an opportunity for teachers to cater for different learning styles while planning their lesson. Below are some of the features of XERTE that were developed for the ER:

- Using video to gain Attention - Beneficial for visual & auditory learners

  Video could be easily added to XERTE tool. Here it enabled pupils to see how the Earth and other planets orbit the Sun. The videos were really helpful as it helped pupils to visualise the activities taking place within our solar system. The teacher could use the options of stop, rewind and replay while viewing the videos. Furthermore, the teacher could set discussion on what the students had already seen and what they were about to see next, thereby making possible anticipatory and participatory learning, that were important in learning (Dickinson, 1998). Some videos were taken from YouTube (For e.g. Source: http://www.youtube.com/watch?v=wjQJMeq7_Pk).

- Adding sound effects to pictures - Beneficial to auditory Learner

  Different pictures on planets and the solar system were projected through the IWB and each was accompanied with audio (MP3) giving a brief description of the subject. The use of sound enhanced learning for auditory students.

- Click to reveal activity - kinaesthetic & visual learner

  Figure 1 shows an interactive tool available in XERTE. On the IWB, the student was able to find out more information on the topic by just the click of the pen.

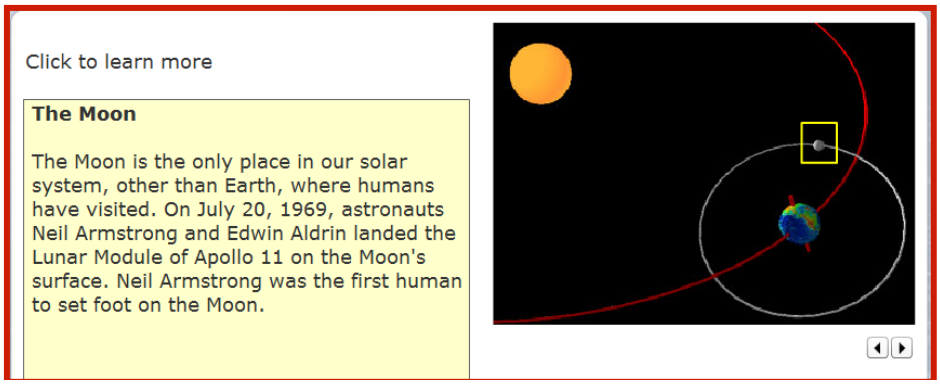


Figure 1: *Pupils can click on the object to learn more*

- Drag and drop activity—kinaesthetic learner

From the observation, it was found that the students enjoyed dragging the words in the space provided as it would not accept a wrong answer; therefore they had to try again, Figure 2. Often the pupils could not drag the word in one go as it would escape the pen and therefore they had to try again.

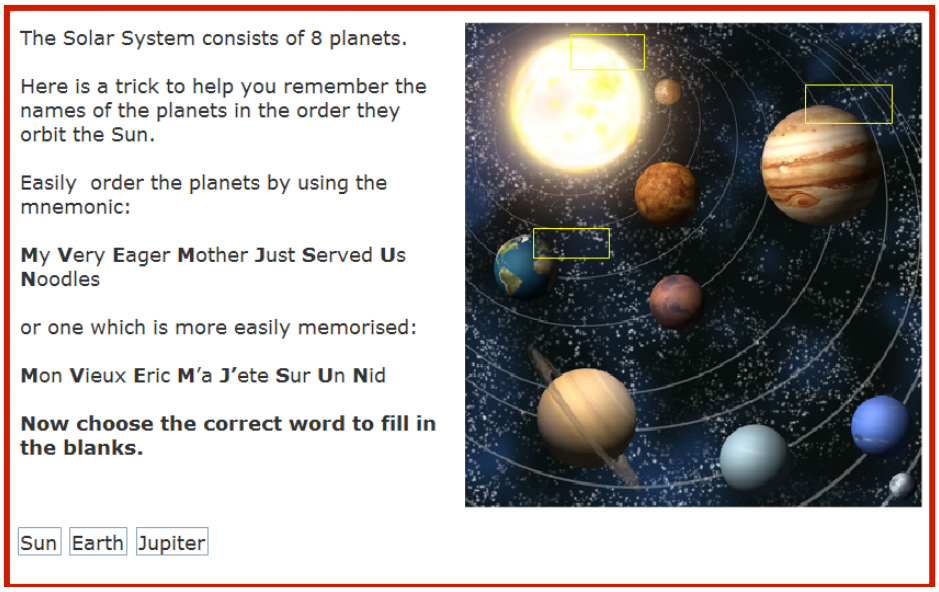


Figure 2: *Interactive activity where pupils can click and drop the correct word in the appropriate box*

According to Dickinson (1998), these kinesthetic activities mentioned above, should reinforce learning and make the student an active participant while learning.

Formative evaluations were carried out using exercises such as: Matching, quiz, true/false, multiple choice questions (MCQ), closed test and classifying, (Garrison et al. 2012). Immediate feedbacks were obtained and teacher took the necessary actions accordingly.

A few examples of interactive exercises included in the ER are shown below:

a) Multiple choice questions:

Pupils could also answer a set of questions, Figure 3. Some students were requested to go on the IWB and to click on the correct answer. This activity allowed the students to get immediate feedback. The whole class could then see the feedback and knew whether the answer was right or wrong.

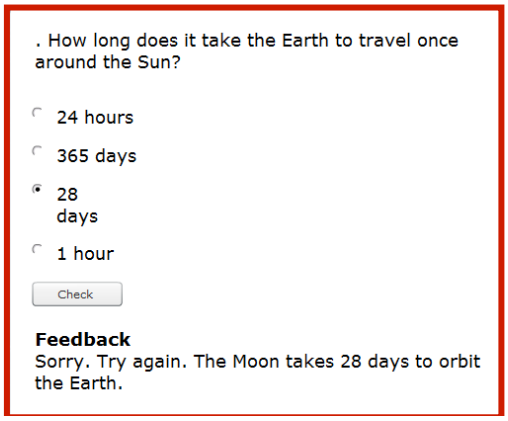
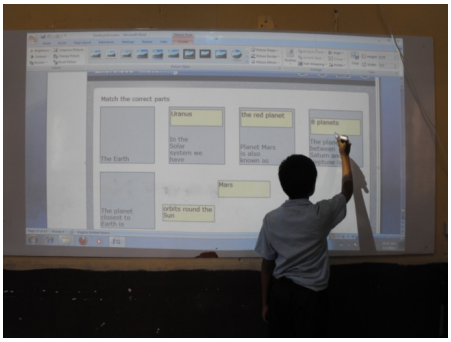


Figure 3: *Showing the feedback received by pupils*

b) Matching Exercise

Other students were asked to do this activity on the IWB as shown in Figure 4. Each student was given the opportunity to use the IWB and attend a particular activity which was integrated in the ER. When they clicked on the 'check answers' button, they got immediate feedback. This allowed the students to know whether they got the right answer or not.



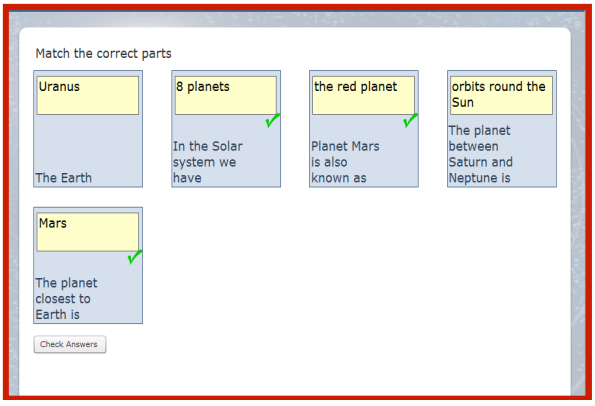


Figure 4: *Showing matching Exercises which can be done by pupils*

The survey

125 questionnaires were distributed to primary school teachers in 13 schools. The criteria used to choose the schools were:

- Schools from each of the four educational zones should be represented as shown in Table 3.
- Different levels of schools were chosen; high performing, average and low performing.
- The teaching staff should represent different age groups.

Table 3: *Showing the number of schools chosen in different regions*

Region	Number of schools chosen
North	3
East	2
South	2
West	3
Central	3

RESULTS AND ANALYSIS

XERTE as Educational Resource (ER)

Table 4: *Results obtained from the pre-test carried out in all 3 classes*

Question Number	Same Result using IWB	Same Result without IWB	Better Result using IWB	Better Result without IWB	Worse Result using IWB	Worse Result without IWB
1	36	32	03	06	01	02
2	21	22	19	18	-	-
3	18	26	16	14	06	-
4	19	14	21	26	-	-
5	23	20	14	19	03	01
6	25	14	13	24	02	02
7	12	18	27	19	01	03
8	21	27	12	12	07	01
9	26	21	09	07	05	12
10	23	22	08	05	09	13
TOTAL	**224**	**216**	**142**	**150**	**34**	**34**
Means	**22.4**	**21.6**	**14.2**	**15**	**3.4**	**3.4**
T-calculated	**-0.137**		**0.330**		**0.56**	

It was observed, while conducting the class, that the pupils in the controlled groups enjoyed working with the XERTE tool. They could navigate easily from one page to others and they enjoyed the videos and also the fact that they got immediate feedback for exercises or activities that they have carried out. The answers from the pre-test and the post-test were compared to find out how far pupils had improved after the lessons were carried out, Table 4. Then the data collected, were further analysed.

The critical T-value (2.262) is greater than the T- calculated values which are -0.137, 0.330 and 0.56 respectively; thus the null hypotheses cannot be rejected. We can then conclude that there is no difference in the scores obtained by the students for each question.

There were not many differences between the marks obtained by all groups. Students learning via the IWB and the ER had obtained approximately the same marks for the pre-test. This was probably due to the fact that both groups had the same number of pupils of high, average and low abilities.

Questionnaire 2 was set after the learning lessons on 'Our Solar System' containing 18 questions which were further analysed. The questionnaire had generated 21 answers as one question consisted of 4 parts. Using tally marks right and wrong answers were recorded for both IWB and traditional classes. The bar chart in Figure 5 shows the results obtained from the post-test. The results obtained were further summarised and shown in the Table 5.

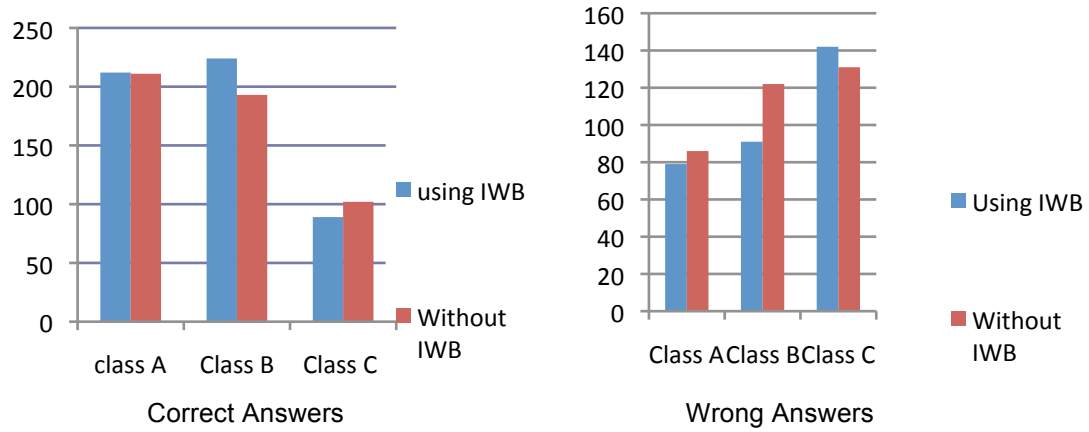


Figure 5: *Results obtained from post-test*

Table 5: *Showing overall results obtained for the post-test*

	Right Answer		**Wrong Answer**	
	With IWB	**Without IWB**	**With IWB**	**Without IWB**
Class A	212	211	79	86
Class B	224	193	91	122
Class C	89	102	142	131

From the bar charts in Figure 5, class A and class C revealed slight differences in their correct answers while comparing IWB to traditional teaching method. Only in class B that the pupils had received better results with the IWB.
The mean performance of students who answered correctly using the IWB was 6.6 as compared to 6.3 for those who did not use the IWB. As those who answered the questions wrong, the means performance was 3.9 for those who used IWB as compared to 4.2 to those who did not use the IWB. The T- test revealed that there are no significant differences between the two marks obtained by the students. These may be explained by the fact that in both groups there were students of same abilities. We can see that all the classes performed as well using both traditional and IWB. This further confirms the findings that pupils learn equally well using the traditional method and the new technology of today, the IWB. From an observational perspective, the IWB classes generated more enthusiasm and attention from the students. This could be the result of their novelty factor, however, and as shown, this did not translate into any significant improvements in performance. Some negative affordances for education were noted with the introduction of the IWB in the classroom as listed below:

1. Students concentrated more on the images, sound, colours and interactivity instead of paying full attention to the teacher's explanations. They were more focussed on what would come next than pay attention to the content.

2. Students viewed the IWB more like a playful tool rather than a learning one.

3. Students are not yet ready to learn fully using the IWB. They would rather have it as supporting tool to enhance learning.

4. Using IWB brings excitement and enthusiasm in the classroom, thus, changing the moods of students from learning to playing.

5. The questionnaire given used the traditional way of assessment and did not involve any technology.

This study also showed that pupils learn well in formal classroom settings as:

- They have been trained to learn using the talk and chalk method.

- The traditional blackboard and the words written on them make a lot of sense to the students.

- Pictures, drawings and other teaching aids help them to grasp the concepts.

Observations indicated that the students in these classes were less active than in the IWB ones.

Results obtained from survey

Out of 125 survey questionnaires distributed to teachers in Mauritius, 102 were completed and returned. A summary of the finding is reported below.

91% of teachers who participated in the survey were positive that the IWB was a useful tool. Using IWB for teaching provides a technological bridge between students' daily lives and their educational experiences. Moreover teachers are aware that one of the biggest advantages of using the IWB in classes are that different types of learners can benefit by using different types of

sensory stimulation. Visual learners can enjoy the colours, graphics, pictures, graphs, mind maps and so on; kinaesthetic learners can appreciate videos and animations and can touch and move things on the board; audio and video files can be used to add to classroom discussion to stimulate auditory learners (Glover & Miller 2001; Billard 2002; Bell 2002 as cited in Smith 2005). Only 6% of teachers did not find the IWB useful most probably because they were more at ease teaching using the ordinary board and do not want to change their teaching habits. The possibility of integrating multimedia was a very important asset of the IWB according to many teachers surveyed. The IWB offers students the opportunity to become creative and active learners. Some teachers liked the ability to add pictures, sounds, videos, web links, texts and other combinations to anything displayed on the board. This action is apparently simple but promotes constructivist-type learning experiences (Martin, 2011).

Other teachers preferred the touch-sensitive screen. Students and teachers can control the board and manipulate applications with the tips of their fingers or with a pen. It was interesting to find that most teachers thought that the IWB would be mostly used in History /Geography and Science classes. Some 22% teachers were of the opinion that it could be used in all subjects and the rest thought that it could be used in Maths and Languages only. This demonstrates that teachers associate Science and History/ Geography as subjects with complex concepts and they think that the use of IWB will help students to understand these concepts better. As for languages most teachers did not find the need to teach them using IWB as they are considered as static subjects. A few teachers said that Mathematics may be taught using digital tool as some topics would be better understood by using interactivity and multimedia.

Among the 102 teachers surveyed 38% had seen the IWB while 28% had used it, 21% had only tried it and 13% had not used it so far. As part of the Sankoré project, the IWBs were only implemented in only one class of standard 4 of each school. Only one teacher from standard four from each school was given a half day workshop on the use of the IWB. It is to be noted that among the respondents, there were 27 teachers in charge of a standard four. Therefore apart from these teachers, only 12 more had seen the IWB. The others had not done so because at school level no opportunities were provided to them. Another reason was that the IWB was installed and connected to only one class and therefore it was not accessible to all teachers. This also indicated that some teachers were not really interested in this new tool or else they would have tried at least to see it once. Only 29% of the teachers had used the IWB out of which only 4% teachers, not in charge of standard four, had used the IWB. This is not in line with the aims of the Ministry of Education. Circulars from the Ministry of Education were sent to all schools instructing head of schools to allow all teachers to use the IWB irrespective of the class taken. It was further seen that teachers who had tried the IWB included deputy headmasters who had attended the workshops and had tried the tool there itself and some teachers who were interested in the digital tool.

Among teachers who had not used the IWB (50%), the main reason given was that it was found in a classroom which was being used by another teacher and thus they did not have easy access to it. Some other teachers pointed out that no opportunity was provided to them at the school level to use the IWB. The aim of Sankoré project was in the first instance to place one IWB in a standard 4 classroom in each school. All teachers especially other standard 4 teachers should have easy access to the board and use it with their pupils. Therefore, head of schools should have seen to it that all teachers could access the digital board and use it as per a specific time table. In addition teachers encountered many other barriers in using the IWB such as:

- It was not easy to find real interactive resources prepared by Ministry of Education and many of these resources would not work on the IWB due to technical issues.

- It required a lot of ICT skills which most teachers did not possess.

- It was time consuming as they were not used to teaching this way and it required time to set up the digital tool and do some trouble shooting occasionally.

Respondents also agreed that the pressure to meet other academic requirements was an important barrier to using IWB. As the syllabus was bulky, teachers found themselves in a rat race to finish it. Therefore they were not ready to venture using the IWB as it would cause delay to their work.

Among the 50 teachers who had used the IWB, 24 found it easy to use, 14 very easy, 10 a bit difficult and 2 very difficult. Here most teachers found it easy to use the IWB because they possess the necessary skills. It was noted that almost half of the respondents surveyed were aged between 20-35 years, Table 6. Teachers, who were fifty years and above, found it difficult to use the IWB.

Table 6: *Showing the distribution of the age of teachers surveyed*

Age of teachers in years	**Teachers surveyed**	**Teachers in charge of std 4**
20- 25	7	1
26- 30	19	5
31-35	25	7
36- 40	12	3
41-45	13	5
46-50	10	3
51-55	5	2
56-60	7	1
Not mentionned	3	-

All together 59 out of 102 teachers stated that they did not feel adequately prepared to use the IWB. They wished to have more training which would enable them to use the IWB more efficiently. Surprisingly, most teachers would like to have an IWB permanently in their classroom for everyday teaching because they believed that it would be helpful in teaching and learning. In answer to the statements concerning the use of IWB, most teachers found that it was most important to have ICT skills, available resources and teachers should have been provided more training in using the IWB and other learning resources. They also said that it was important to have adequate amount of instructional/preparation time, helps from colleagues and ICT teachers and support from Headmaster as shown in Figure 6 below.

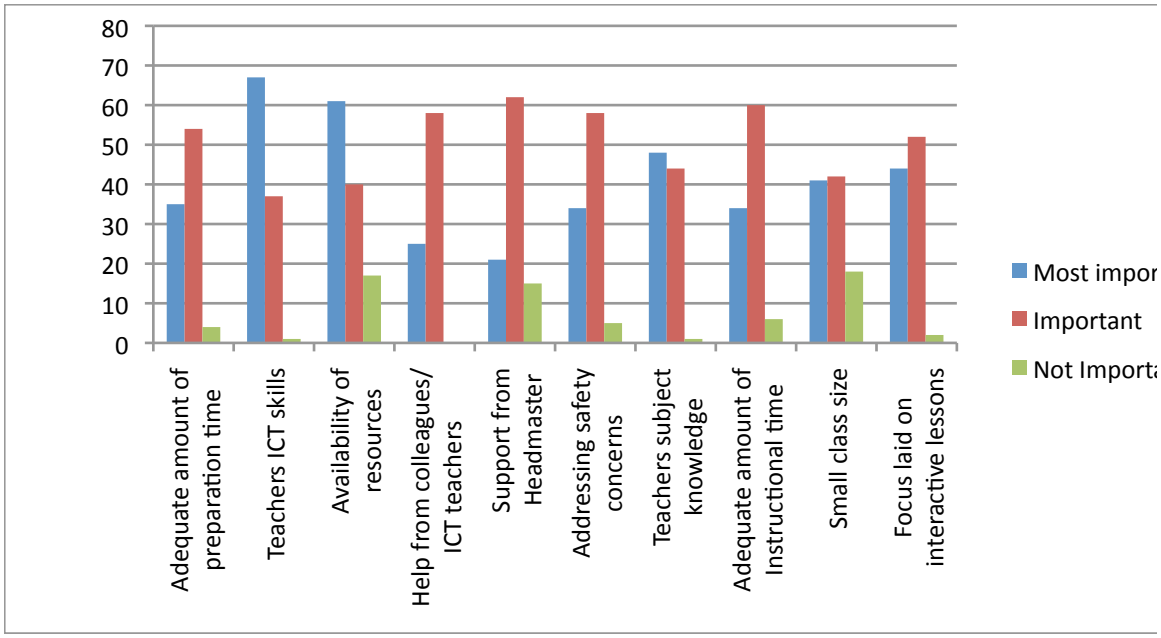


Figure 6: *Bar chart showing statements linked to IWB*

Out of 102 teachers, 81 did not want to have only the IWB in their classroom while 16 said yes and 5 wanted to have both the ordinary and the IWB. Teachers did not want to have only the IWB in class because they thought that:

- Certain lessons could only be taught using the ordinary board.
- In case of power failure/ technical problems they could still use the ordinary board.
- There should be a transitional phase from ordinary board to IWB.

Teachers (69) thought that the IWB would become a reality in all our classrooms because:

- They saw it as an important tool which would help to improve their pupils' results.
- Teachers would adopt it easily as it was a useful tool.
- The interactive whiteboard was the missing link as a tool for connecting teaching to learning in a digital world (Betcher et al, 2009).

Many teachers thought that it would take a long time for them to become at ease while using it as a teaching tool because most teachers have basic ICT skills only. To use the IWB at its full potential, teachers would need to prepare their own interactive resources in the long run, which would match the class level and the reality of the pupils. Smith (2005) reported that once the resources have been prepared, they can be saved and re-used or even be shared amongst colleagues. This would demand a better command of technology from teachers. Most teachers said it was an effective tool as they thought it would bring the long awaited change in the teaching and learning system as it offered many advantages. Only 19 said that it would become just another trend and further added that this would be forgotten after some time as teachers would revert to their old way of teaching.

CONCLUSION

The use of IWB is still in its teething stage in the primary schools of Mauritius. This study allowed teachers and students, both to give their perceptions of this tool. The research was mostly geared towards finding out whether the IWB was an effective tool for teaching and learning and the reasons behind teachers' resistance to using it.

The research was carried out with 3 different classes from 2 different schools to find out whether students learning improved when the IWB was used. No major difference was noticed in results between learning using the IWB and learning using the traditional blackboard. However the assessment still requires memorising as they are done using the same old method of paper and pen.
Following this analysis, it is possible to argue that the teachers' conviction that IWBs are effective is some kind of 'halo' effect inferred from the increased attention and motivation of pupils. The newness of the technology was initially welcomed by pupils but any boost in motivation seemed short-lived. Statistical analysis showed no impact on pupil performance in the first year in schools which were fully equipped (Marques, 2011).

The survey carried among teachers led to conclude that most teachers agreed that the IWB was an effective tool as it benefited to all types of learners. Yet they were not ready to use it as they lacked the necessary skills. Proper training of teachers and providing them with interactive resources during lessons are the main actions to be taken in the short term. After that, teachers could be guided towards preparing their own resources and sharing them between and among teachers in their school and then move towards sharing them with the teacher community at large throughout the world.

After the blackboard which was the first revolution in educational sector in the year 1800 (Team Clarus, 2012), the IWB is definitely going to mark the educational sector as the second revolution. The IWB is an essential teaching and learning tool when used appropriately. It does not serve the purpose when teachers use it as an extension of the blackboard and do the same activities that they would have done using the ordinary board.

RECOMMENDATIONS

If the authorities and educators want to make the IWB to become a tool 'par excellence', below are some suggestions to improve its use:

- More training and ongoing support for educators in order for them to make maximum use of the interactive boards.

- The head of schools should designate a member of his staff to be responsible for the IWB.

- Materials available for use with the IWB should be kept in the custody of a team of teachers who will be responsible to look for more materials available and to adapt them to suit the needs of the pupils.

- Identify a team of teachers in schools who are efficient in using the IWB so that they can help their colleagues by either conducting small work sessions during the lunch hour to initiate them or by being present when they are using this tool. This will help those who lack skills at school level and give them ongoing supports.

- Teachers should work collaboratively with colleagues and experts and exchange experiences and sound practices.
- Teachers must share materials and lesson plans with colleagues at school level thus saving precious time which can be dedicated to teaching.
- Teachers should use IWBs for creative and interactive activities which would not be possible using an ordinary whiteboard.
- Have good Internet connection in schools so that teachers and students do not become frustrated waiting for programs to load.
- Identify a team within the personnel who will be responsible for trouble shooting and maintenance of software and hardware.
- Educators must have good support from the head of school and from their colleagues.
- Schools should have a budgetary support towards the cost of internet connection, purchase of lessons, maintenance and other elements of IWB.
- Final assessment of students should be made using technology.

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