# The Effectiveness of Algodoo with Interactive Whiteboards for Teaching Physics in Saudi Secondary Schools

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## Abstract

*Without doubt, the interactive whiteboard (IWB) has become a popular educational tool in Saudi schools. The IWB is a large touchscreen that permits users to interact with digital content, either via an ordinary computer or a projector. At present, the specialised utilities of IWBs are seldom leveraged to augment learning at secondary school level. This is particularly evident at secondary school in physics lessons. This research explores how teachers in a public secondary school setting use Algodoo with the IWB to teach physics and evaluates their perceptions of its benefits. The research employs a qualitative case study method to reveal teachers' experiences of the processes of lesson preparation, lesson planning and implementation of lessons utilising Algodoo software with the IWB. The data was collected through interviews and observations via Skype. The conceptual approach of activity theory was applied to the data analysis. It emerged that students become more interactive during lessons when teachers use the Algodoo programme, and that it enhances learning. Moreover, Algodoo affords students an opportunity to participate in the lesson. However, it was apparent that teachers' confidence and mastery of Algodoo used with the IWB play a significant role in the effectiveness of the tool. Consequently, it is proposed that training courses for teachers should be provided when introducing new technology to the classroom. This research is a useful resource for other IWB-related studies and will contribute to the efficacious application of modern technologies within Saudi educational contexts.*

*Keywords: Interactive Whiteboard (IWB). Algodoo software. Benefits and weaknesses of Algodoo. Student engagement. Student interaction*

## 1. Introduction

Education is the foundation of development in societies worldwide, and so the governments of all countries are continually seeking to improve and develop their education systems. Traditional face-to-face modes of learning continue to be an important and beneficial component of the educational process, however, the current rapid advances in educational technology are also significant. Indeed, it is increasingly apparent that the educational process and learner successes can be improved using technology in education. Previous research has stressed the benefits of the use of technology in schools in developed and developing countries, and explored whether it is reasonable for schools to have confidence in the affordances of technology to enhance learning [1]. The context of this study, Saudi Arabia is a notable example of a country that has introduced technology to develop its educational system over the past two decades.

This paper examines some of the challenges that Saudi physics teachers have encountered with utilising technological resources. As a physics teacher, this author has personally observed both the beneficial effects of different types of technology on students and barriers to their use. A popular technological device currently used in Saudi classrooms is the Interactive Whiteboard (IWB) (or smart board). Teachers can use the IWB to bolster the effectiveness of their lessons, motivating students by transitioning from traditional methods of instruction to more contemporary interactive and constructive methods. IWB technology is increasing in popularity, because it appears to provide teachers and students with options that can facilitate teaching and learning. [2]. Although various advantages have been associated with IWB technology, it is the responsibility of teachers to utilise its positive features and to integrate them into their current teaching methodologies. Moreover, effective integration requires appropriate teacher training, for teachers to be open to the idea of IWB use, as well as support from administrators.

This study aims to investigate the impact of using Algodoo software [3] with IWB technology in Saudi public sector secondary schools. This section highlights the rationale which reinforces this research. It also observes that Saudi physics teachers are typically reluctant to use technology, particularly IWBs, in the classroom, preferring traditional teaching methods that readily mesh with the curriculum.

This study has been designed to provide insight into both the use of IWBs in combination with Algodoo, and teachers' perceptions of the benefits and challenges they face when doing so within the Saudi secondary school context. This study aims to address the gap in the literature concerning negotiated interactions about using technology like IWB and Algodoo software in such institutions as Saudi secondary schools. Furthermore, only a small number of research projects have examined the impact of IWBs on physics teaching, and the effect of IWB use in the Saudi classroom is not yet clear.

The rationale and aims given above resulted in the development of a set of research questions as outlined below:

- How do Saudi secondary physics teachers use Algodoo with IWBs in the classroom?
- What are Saudi secondary teachers' perceptions about the benefits of using Algodoo with IWBs when teaching physics?

### *Significance of the study*

The data collected and analysed for this study provide an overview of Algodoo use with IWBs for teaching physics in the Saudi secondary school setting. It is this author's belief that this research therefore provides valuable insights that enable teachers to benefit from the opportunity to integrate and promote IWB use within the physics curriculum. In addition, the study reveals some of the methods that teachers employ when using Algodoo with IWBs in classrooms, providing examples and ideas for other physics teachers working in a secondary school setting.

Furthermore, it may encourage inclusion of training on the use of IWB technology in pre-service teacher training degree programmes and facilitate in-service training of teachers at educational institutions throughout Saudi Arabia.

## 2. Literature review

Over recent decades, interactive technology, including computers, the Internet and electronic multimedia, have become part of our daily lives. Many countries are spending large sums of money without a clear understanding of how technology will impact their teachers and students. Although many researchers support the introduction of technology as a way to maximise student achievement [4], others question its efficacy in terms of student outcomes [5]. Thus, it is apparent that more research is needed to clarify the link between technology, pedagogical techniques and content knowledge, as well as exploring teachers' views about technology use within classrooms [6].

Academic researchers have investigated IWB use in schools in multiple contexts. These studies have focused on different aspects of the technology as used in educational settings, including how it relates to motivation, teachers and students' views, pedagogical advantages and technical issues using IWBs in classrooms [7]. There is scope for further research examining the effectiveness of the IWB as a tool for teaching in secondary schools. Prior to conducting this research an extensive previous studies were reviewed, and no exploration addressing IWB use combined with Algodoo for teaching physics in Saudi secondary schools was found.

Technology can be instrumental as a means to explain and clarify subject content in a number of fields; one of which is physics. The use of technology for teaching physics can be instrumental as a tool for enhancing student comprehension. In addition, many teachers have reported that digital technologies also facilitate classroom teaching; research also indicates that teachers can only transfer their physics knowledge and skills to students if they adopt effective teaching strategies that ensure that knowledge is accessible [8].

Different technologies can be used in the classroom to enhance physics teaching and preparation. For example, physics teachers might use a computer and IWB to perform experiments more readily, in order that students can comprehend material in an exciting way. However, the choice of technology in the classroom depends on several factors. These include the size of the class, both in terms of number of students and physical space. Other factors include the adaptability of the technology, teacher's preparation, professional development and accessibility to the technology. All the factors mentioned above need to be considered before deciding on whether to incorporate technology into the classroom environment or not. Some of these factors might be easy to address, while others may be harder to perceive. However, a balance must be struck by teachers to determine the best technologies to integrate into their classrooms.

Educational technology has progressed considerably in recent decades. The use of IWBs has brought about great progress in the field of education in both developed and developing countries, revolutionising the teaching and learning process by potentially changing the roles of teachers and learners [7]. In many Asian countries, including Saudi Arabia, technology use is limited by a lack of facilities and time. Therefore, IWBs represent a useful affordance, as they facilitate both local and remote communication and collaboration on scientific topics [9].

The IWB has been introduced to classrooms over the last two decades. In Saudi Arabia, the implementation of IWB technology in secondary schools is in its infancy. It is also important to note here that technological knowledge includes not only understanding of tools and machines, but also of their impact on processes and systems, on society, and on the way, people think, perceive, and define their world.

In the Saudi context, IWB technology is considered innovative, and schools are in the process of discovering how to implement it to develop teaching practice. As stated above, IWB use is being rapidly adopted throughout all Saudi schools. However, when moving quickly to integrate innovative technologies, decisions are being made without considering teachers' perspectives. Therefore, this study attempts to discover teachers' practices and perceptions regarding using IWBs with Algodoo software in Saudi secondary schools.

IWBs help students to visualise and understand lesson content, for example, by presenting physical experiments that make material more visible to students. Shi et al. [3] implied that the use of IWBs can support instruction, describing boards as "pedagogical tools for the acceleration of interactive instruction for the whole class". In addition, the IWB allows teachers access to features such as rich materials and they give easy accessibility while using it in classroom settings [10]. In summary, the IWB can assist teachers to increase the level of interaction among students, to encourage them to be more active in the classroom by allowing them to write on it, or to drag objects and symbols onto the board during the lesson.

Nevertheless, the benefits of the IWB are heavily dependent on the teacher's opinion of the technology and their ability to use it effectively. For example, if instructors utilise the IWB merely for writing or drawing then it offers no value over an ordinary blackboard. Gashan and Alshumaimeri [11] reported that teachers view using instructional tools in IWBs as useful for reinforcing their teaching, but they are limited by their insufficient technical knowledge.

Therefore, in order to guarantee the benefits of the IWB are achieved, teachers require training on how to use it in an appealing way.

### 2.1. Brief explanation/description of activity theory

A later phase in the analysis of the outcomes of the research process was considered relative to activity theory when analyzing teachers' processes [13]. It asserts that the activity system functions as an essential unit of behaviour, in this case the interactions of teachers, with individual and collective consequences [12].

Tools: The IWB makes it possible to observe the activity, while the virtual objects available via the program illustrate the concepts being taught. In the schools where the study took place, IWBs are used regularly, but often serve simply as replacements for traditional boards and projection screens. We used the IWB, coupled with Algodoo software to represent content in different ways.

Subjects and Objects: We chose to conduct the research at five schools, including one physics teacher volunteer in each school. Each class comprised between 22 and 25 pupils. The teachers presented two physics lessons using Algodoo with the IWB (the Archimedes principle and reflecting light). The primary aim was to explore the benefits to physics teachers and students when using Algodoo. A secondary aim was to evaluate the extent of students' understanding following the lesson.

Division of labour: In the schools where the study was conducted, we approached teachers rather than students as participants.

Activity theory was appropriate for this research as it fits the research environment. For example, it allows several different levels of analysis, both collectively and individually. In addition, the principle of "object-orientedness" exemplifies the relationship between the technology (Algodoo software with IWB) and the teachers. In addition, it describes human activity: the teacher uses tools to explain specific information when teaching. In summary, the aim of the activity theory principle is to develop and implement human ideas arising within a meaningful context to achieve specific social goals between a person and their surrounding environment. Activity theory enables data analysis that explains fundamental factors or influences behind the phenomena observed.

## 3. Methodology

This section addresses the methodological approaches, case study strategy, study sample and data collection methods (interviews and observation) before moving on to consider data analysis.

### 3.1. Methodological approaches

The two main approaches for collecting data are qualitative and quantitative. According to Creswell [13], qualitative research can be defined as "an enquiry process of understanding based on distinct methodological traditions of inquiry that explore a social or human problem". By contrast, the quantitative approach focuses on describing a phenomenon by collecting numerical data to test theories by identifying and examining relationships between variables, that are then measured by applying statistical techniques [14]. This research employs a qualitative approach to gather descriptive and in-depth data about teachers' and learners' experiences and perspectives when using Algodoo software with IWBs in the physics classroom. In addition, the qualitative approach aligns with a constructivist ontology and an interpretivist epistemology.

### 3.2. Case study

A common approach to qualitative inquiry is the case study method. Yin [15] states that "case studies are the preferred strategy when 'how' or 'why' questions are being posed, when the investigator has little control over events, and when the focus is on a contemporary phenomenon within some real-life context". According to Gerring, "the case study provides in depth analysis of phenomena that are best understood with a high level of detail, richness, completeness, wholeness, and degree of variance" [16]. This research adopts a case study approach for these reasons.

### 3.3. Sample

Sampling refers to the process of selecting a portion of a population that conforms to a designated set of specifications to be studied. As the aim of this research is to ascertain how teachers and students experience and view using Algodoo software with IWBs in physics classrooms, the sampling method selected is purposive sampling. According to Creswell [13] purposive sampling refers to the selection of those participants that will best help the researcher understand the problem and answer the research questions. The study was conducted in five secondary schools in Saudi Arabia that use IWBs in their classrooms. The respondents included five physics teachers and ten students aged 13 years old. The study was conducted over two months to allow the teachers to use the IWB with the Algodoo software. This gave the teachers a realistic time frame to trial and evaluate Algodoo used with the IWB to teach physics.

### 3.4. Data collection

In case study research, the application of different methods of data collection is considered crucial to successful data collection [16]. Thus, selecting an appropriate data collection method relies on setting target research questions and objectives. For this study, interviews and observations were selected as methods to better understand subjects' opinions, behaviour, experiences, and phenomena. The researcher conducted observations of all classes, and conducted interviews with teachers via Skype, recording details of students' behaviour and interactions when using Algodoo.

### 3.5. Interviews

In qualitative research, interviews are the most used method, as they allow the researcher to understand reality from the participants' point of view [17]. Thus, using an interview gives the researcher an opportunity to understand and investigate the experiences and views of participants that would not be achievable using other methods. Moreover, it gives the interviewees an opportunity to express their views and explain their ideas relative to the research topic. Semi-structured interviews were used in this research to give the interviewees freedom to express their views, while ensuring the main issues were also covered. This type of interview is flexible, allowing the interviewer to modify and restructure particular questions according to the direction of the interview.

### 3.6. Observations

Observational methods are one of the main data collection tools. In this study the researcher attended the lesson via Skype to watch the physics teacher apply Algodoo with the IWB. During the observations notes were taken to establish interview questions and to observe students' interactions with the new method.

### 3.7. Triangulation

It was evident that the use of interviews and observations with teachers and students generates a certain quantity of information and perspectives. To obtain accurate results, the data must be compared across different sources [18].

Triangulation is considered qualitative research, designed to test validity by retrieving data from different sources. According to Casey and Murphy, triangulation is a powerful technique that maintains and facilitates the validation of data through cross verification of two or more sources that capture different dimensions of the same phenomenon [19].

Methodological triangulation is divided into two types: across method and within method. The researcher combined both quantitative and qualitative data collection techniques; whereas the latter means researcher use two or more collection procedures applying the same approach. This research adopts within-method triangulation, using two qualitative data collection procedures: interviews and observation. Thus, by combining these two methods, the validity of the data is maintained and gaps that could arise when using a single method of data collection are reduced.

### 3.8. Data analysis

In order to conduct a study into the implementation of a specific policy, attention must be given to policy documentation, the work it references, and any subsequent documentation produced to support it. In this section, the researcher discussed how teachers can analyse and interpret information using the Algodoo application with the IWB. The students' views and their feelings were also discussed when teachers use Algodoo with the IWB. Hammersley and Atkinson [19] propose a list of focus questions to be used as the basis for a critical analysis of documentation. These are:

- What do you think about using new material with the IWB?
- How did students interact during the lesson?
- What are the benefits of using Algodoo with the IWB?
- What are the weaknesses of using Algodoo with the IWB?
- What difficulties did you encounter when using Algodoo with the IWB?

The researcher asked these questions to identify, clarify and analyse the aims and objectives of the research, enabling a clearly structured critical evaluation of the research. It was evident that the use of interviews and observations with teachers and students generates a certain quantity of information and perspectives. To obtain accurate results, the data must be compared across different sources [18].

## 4. Presentation and Discussion of the Findings at Different Stages of the Research Process

The aim of this research study was to examine the use of Algodoo software with IWB technology to teach physics in Saudi secondary schools. Five secondary-school physics teachers working at five different Saudi schools in Taif city were asked to use an IWB with Algodoo software, for the purpose of teaching students to investigate mass in relation to water (i.e., the Archimedes principle), and to use the same program to explain what happens to light when it collides with a glass surface. During subsequent in-depth interviews, the participants reported their perceptions and experiences when using Algodoo in their classroom over the study period. Observations were also made of the actual lessons and recorded for analysis using activity theory.

### 4.1. Discussions about lesson content and software between researcher and teacher participants

In this section, the researcher discusses how teachers introduced, analysed, and interpreted information using the Algodoo application with the IWB. It also discusses teachers' perceptions of the students' views and their feelings when teachers use Algodoo with the IWB.

**4.1.1. Participants' experiences when using an IWB with Algodoo software.** The study participants ranged in age from 30 to 40 years old, and all were male. One participant stated that he had regularly used an IWB in his classroom for seven years, but had never encountered Algodoo software; therefore, he was very excited to learn more about the program. Three of the participants mentioned using IWB technology frequently and expressed a desire to learn more about Algodoo. One participant rarely used the IWB, because he had not found it to appeal to students. He changed his mind after participating in the experiment. All five participants stated they had special education experience and observed that this was a requirement in their current roles as teachers. The interviewees all contributed to the study by providing diverse information about their use of Algodoo to teach two physics lessons. The participants' opinions are reported in Section 4.3.

**4.1.2. The researcher's contribution to the teachers' lesson planning content and processes.** Prior to conducting the experiment with the students present, the teachers were shown how to use the program's features to identify relevant topics, such as gravity, planetary motion, dropping items in water and drawing shapes of different sizes. In addition, the teachers were shown how to use Algodoo to create a brief 5-minute video. The basic methods required to use Algodoo with the IWB were also communicated, and the teachers encouraged to download the software onto their laptops to acquaint themselves with it before the activity session. All the participants tested the software on their own computers, but explained they were unsure about how best to use Algodoo to implement physics experiments. The participants were aware of the basics of the program and touchscreens, and all the teachers were able to utilize the IWB.

### 4.2. Lesson observations via Skype – data from observations

To establish a structure for the study participants to follow when implementing the new materials, it was essential to first clarify key characteristics of the study context. The researcher and the teachers discussed possible uses of the software and lesson content. Thus, the researcher first observed physics teachers using the Algodoo software with an IWB in their lessons, and then conducted semi-structured interviews to gather information about the benefits participants had experienced by using the software. All observations were conducted via Skype, so the researcher was present in the classroom to contribute to the lesson if necessary.

The teacher began by dropping shapes made from different substances into the water, e.g.: steel, glass,

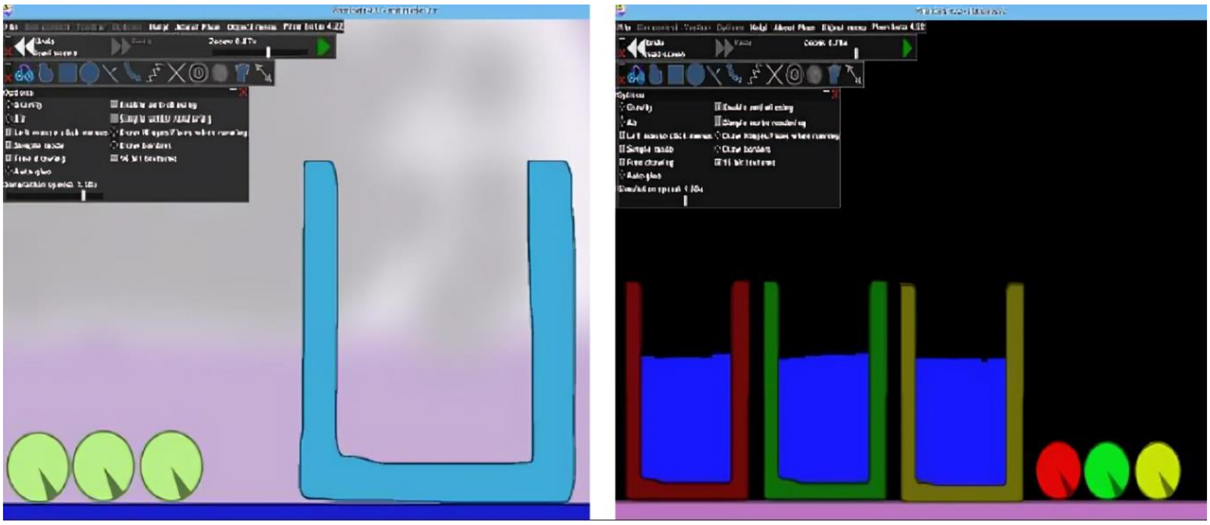

Figure 1. Example of a simulation program output on the topic of the Archimedes' principle

rubber and wood (see Figure 1), triggering fruitful discussions and inquiries throughout the lesson. When the pupils began to identify certain patterns, the researcher encouraged them to investigate further, to characterise and test their veracity. Although the students became accustomed to the software's intuitive interface, and learned how to use the program tools, the teachers also adjusted at the operations level to help the students avoid technical difficulties.

The teachers also designed small items by drawing them on the board, and then manipulated and dragged them using Algodoo. Each teacher spent 30 minutes working with Algodoo and the IWB. Each lesson was Skype video-recorded and transcribed. The following analysis, references categories used in activity theory to summarize the details of the situations in which the teacher used Algodoo.

## 4.3. Debrief and data collection: interviews with teachers

After each lesson, the teachers were interviewed to ascertain their opinions regarding the use of Algodoo with IWB to teach physics. This information was then combined with the researcher's observations and forms the basis of the following thematically based discussion relating to the findings. Participants were anonymised by using numbers- P1. P2 etc.

**4.3.1. Student engagement.** Using Algodoo software for teaching physics gives students the opportunity to engage in the lesson and increases motivation. This was confirmed by the participants in the interviews and based on the researcher observations. According to P1, P4 the program is excellent and provides information clearly and in a timely manner, while allowing students to participate in the lesson. The researcher also noted that the use of the Algodoo program led to more classroom interactions and greater student engagement when performing the experiments, because the process imitated reality. In addition, P2, P3 and P5 added that when using the Algodoo program they recognised students were more inspired to respond, suggesting improved motivation, and an active approach to learning. The program offers unique characteristics that appeal to students wishing to access scientific knowledge via technology. This finding corresponds with that of Euler and Gregorcic [20] who mentioned that Algodoo has the potential to improve students' participation in physics lessons' activities.

**4.3.2. Benefits of Algodoo.** All the research participants agreed that using Algodoo has multiple advantages when used with IWBs to clarify physics experiments. The benefits of using Algodoo software were identified through discussions with teachers after the lessons and based on the researcher's observations. The most important benefits identified by this research were:

i. Eases delivery of information.

ii. Reflects the concept of a new learning philosophy.

iii. Provides a safe and healthy environment for learning and teaching.

iv. Augments students' understanding of physics.

v. Ensure the stability of the information for a longer period of active education.

vi. Meets the needs of students through practical application (e.g., experiments). Algodoo clarifies the phenomena and dispels ambiguity and provides explanations that result from physics interactions.

**4.3.3. Weaknesses of Algodoo.** The participants also expressed concerns regarding some weaknesses they noted regarding using Algodoo for physics teaching. Participants P1 and P5 mentioned the design of the program demands further development. For example, the distinction between the types of materials according to form (wood - iron - glass). They also added, there should be activation of certain elements to make them more attractive during lessons. On the other hand, P2, P3 and P4 agreed that Algodoo does not cover all physics experiments in secondary school. In addition, the teachers mentioned that Algodoo lacks accuracy with regard to some features. Although there are some weaknesses with the software, all the volunteers expressed their satisfaction with, and interacted well with Algodoo.

**4.3.4. Difficulties using the software.** The participants encountered some difficulties using Algodoo during their classes. The observation notes include evidence of problems with the touch control when drawing and during the dragging process and when moving shapes. This was confirmed by the participants when the researcher spoke with them after the lesson. P1 and P3 stated that Algodoo requires a computer with a modern version of Windows and that the touch control for the IWB needs to be further developed. In addition, P2 and P4 emphasised weaknesses in the tactile response of tool icons on some occasions. Moreover, P5 mentioned difficulties controlling items and switching between icons. Thus, the software requires additional refinement for accuracy, although there are nevertheless many tools that teachers can benefit from in their lessons.

## 4.4. Overall summary of teachers' responses

All the research participants expressed positive opinions about the Algodoo program when used with an IWB to explain concepts in physics. Moreover, it was apparent that participants P1 and P2 agreed the technology contributes to attracting students' attention, thereby facilitating the process of explaining the lesson in an interesting and enjoyable way at low cost. The researcher's observations emphasised that when teachers used the program, the majority of students wanted to be involved actively in the lesson, and teachers confirmed this in the interviews. This suggests using technology not only improves students' comprehension, but it increases their motivation to learn. Similar results have been reported in other studies which have found technology can expand students' achievements, develop educational outcomes, and promote learner motivation [5].

Interestingly, participants P3 and P4 stated that the program stimulates an interest in physics experiments and encouraged the students to work together. Participant P5 added that the software promoted collaborative learning within the classroom environment, by presenting lessons in a way that simulates reality and provides a safe setting for students, evading the dangers that can arise when conducting real life physics experiments. The researcher observed that during the class, the students participated and interacted, assisting one another, and sharing ideas to extend their horizons. This corresponds with Euler and Gregorcic's [20] observations that the program improves students' understanding of physics experiments, by presenting lessons in a stimulating manner using clear visualization, to support students' absorption of the lesson content.

However, the participants also emphasised that additional teacher training courses are essential when introducing new technology, to build teachers' confidence before using software in front of students. It was apparent to the researcher that the teachers spent a lot of time preparing their lessons. Furthermore, P3 and P4 mentioned a lack of confidence about using the Algodoo software, stating that they would need to use it several times to familiarise themselves with all its features. In addition, P1, P2 and P5 suggested a training course would be vital to learn more about the program and benefit from it. Therefore, we can conclude that training courses should be provided to teachers if student outcomes are to be as desired.

During the interviews the teachers mentioned six main disadvantages they had encountered when using Algodoo:

i. The foreign language software does not include Arabic and so the teacher cannot use all the icons.

ii. Not all physics topics are covered, and so further development is required.

iii. it takes time to prepare materials.

iv. It is not possible to write or comment using the tools during the experiment.

v. There are no questions to discuss to evaluate students or measure their understanding of the lesson.

vi. There is no data available for mathematical calculations. Finally, it should be noted that the language problem mentioned had been predicted.

## 5. Conclusion

Technology is now an essential feature of everyday life. Various types of technological tools have been introduced in education, such as the IWB. In the research described the researcher and the teacher participants demonstrated the high potential of a digital tool for teaching physics (i.e., free software Algodoo used with the IWB). We prepared animated simulations to describe how to obtain the mass of an object using the Archimedes principle, whereby the amount of water displaced equates to the object's mass as submerged in water. We also reviewed the reflection of light as it collided with materials. The principal objective of the study was to develop the use of IWBs and engage teachers' perceptions on the benefits and challenges of Algodoo software, within classrooms in Saudi Arabia's secondary schools. The decision to conduct this study was prompted by the researcher's observation (as a physics teacher in Saudi Arabia), that IWBs are generally used merely as ordinary boards.

Algodoo presents instructors and students with a wide diversity of possibilities. It enables teachers to design physics lessons in an appealing way for students and can be adapted during class to encompass students' suggestions and ideas. We demonstrated to teachers how to use Algodoo, and explained how the software might help channel creativity and drive them to be more involved in designing experiments while exploring new ways in teaching physics using technology. Algodoo, or other similar software, can be used in many different contexts and learning approaches, and therefore is beneficial when utilized by teachers. Physics experiments are an essential utility of the tool. Teachers were not encouraged to substitute real experiments for computer simulations, but rather to use them to clarify the implications of real experiments. It was also discussed that software simulations can serve as alternatives when real experiments cannot be conducted.

All the teachers were very enthusiastic about using the simulation software for their classes. The participants believed the simulation program would have a positive influence on their delivery of ideas, and that it would also increase educational relevance. The accessibility of the program and the availability of instructions was also expected to assist with the comprehension of physics lessons. There were no significant problems associated with the use of the software, and it was adaptable to classroom interactivity. The teachers' positive stance towards the simulations adopted in this study conveys the usefulness of the software.

The results indicated that all the teachers were satisfied after using Algodoo software, and all agreed that introducing such tools into classroom education would develop the instructional process effectively. The majority of the teachers emphasised that using the program for teaching physics increased students' understanding and their motivation to learn. It furthered their involvement during the lesson and helped them to better visualize physics experiments. Especially when the software was used expertly. There were some disadvantages noted by teachers, the most important being the second language barrier (English), which increased the length of time spent on lesson preparation and limited the options for writing on the board as well as student participation.

In summary, the results from the observations and interviews reported here suggested participants require training courses to familiarize them with the technology. Training courses would help teachers to be more confident when using IWBs and would help them benefit from the programs and software available to run with these boards. However, we successfully managed to modify teaching methods, at least temporarily, in the context of physics lessons in Saudi schools. The new approach introduced teachers and students to using IWBs with Algodoo as a kinaesthetic activity to enhance opportunities for interactivity in the classroom.

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