# JOURNAL OF HIGHER EDUCATION RESEARCH DISCIPLINES

VOLUME 7, ISSUE 1, JANUARY - DECEMBER 2022

The Journal of Higher Education Research Disciplines (J-HERD) is formerly the "NMSCST Research Journal," a refereed scientific publication of Northwestern Mindan- ao State College of Science and Technology, Tangub City, Philippines. This journal aims to publish research articles in sciences, social sciences, technology, tourism, agriculture, teacher education, and language and communication. This journal is a semi-annual publica- tion of the institution, which seeks to unify these branches of inquiry by publishing quality, peer-reviewed research articles.

The Journal is open to all researchers from various disciplines of different universities and research agencies in the Philippines and outside the country. The publication is free of charge, but only quality papers are accepted.

**Aims and Scope**

The Journal of Higher Education Research Disciplines (J-HERD) is a peer-reviewed, multidisciplinary journal which aims to publish semi-annually research articles in the sci- ences, social sciences, technology, tourism, agriculture, teacher education, and language and communication. The contributors come from different universities and research agen- cies in the Philippines and outside the country. Submitted papers are products of an original work and have not been previously published.

**Peer Review Process**

The Peer Review (also known as refereeing) is the process of subjecting an author's scholarly work, research or ideas to the scrutiny of experts in the same field. It is a way of ensuring that the articles published are of high quality with minimal probability of errors.

The Journal of Higher Education Research Disciplines adopts the double-blind re- view process wherein the reviewer and the author do not know each other's identity. It is the obligation of the Editorial Team to assign the peer reviewers for a particular manuscript submitted for publication. These peer reviewers are not selected from among colleagues and those who are in close association with the author(s). Likewise, the editorial staff en- sures that the peer reviewers must hold the distinction of having published in ISI or indexed journals, and have the expertise of the topic under review. Two external referees are invited for each research paper.

However, only the paper that meets the editorial criteria is sent for formal review. Once a referee accepts the invitation, within a specified time frame (within 2 to 4 weeks), the referee provides feedback through the online journal system of NMSCST. Subsequently, the management evaluates the referee's decision and comments before noti- fying the author(s) about the result of refereeing.

A manuscript is accepted when it is endorsed for publication by the two (2) referees; the instructions of reviewers are substantially complied; ethical standard and protocols are followed for studies, including humans and animals; and manuscript passed the plagiarism detection with at least 85% for originality and at least 80% of grammar issues. Otherwise, it is rejected.

The editors make decisions based on the reviewer's advice, from among several possibilities;

Accept, with or without revision.

Invite the authors to revise their manuscript to specific concerns before a final deci- sion is reached.

Reject, but indicate to the authors that they may resubmit the manuscript if revised thoroughly.

Reject outright, typically on grounds of technical and/or interpretational problems. Authors are advised to use licensed software for plagiarism detection and to perform spell- ing and grammar checks prior to paper submission.

**Publication Frequency**

J-HERD is published semi-annually, both print and online. Circulation is scheduled during the second and the last quarter of the year.

**Open Access Policy**

This journal provides open access to its content for wider dissemination of research findings and to support a worldwide exchange of knowledge.

## Submission Preparation Checklist

As part of the submission process, authors are required to check off their submis- sion's compliance with all of the following items, and submissions may be returned to au- thors that do not adhere to these guidelines.

•The submission has not been previously published, nor is it before another journal for consideration (or an explanation has been provided in Comments to the Editor).

•The submission file is in Open Office, Microsoft Word, or RTF document file format.

•The text adheres to stylistic and bibliographic requirements outlined in the Author Guidelines.

## Copyright Notice

The copyright of the article will be transferred to the Journal of Higher Education Research Disciplines and to the Northwestern Mindanao State College of Science and Tech- nology. Once the paper is accepted for publication, the authors must accomplish and submit the copyright transfer document to J-HERD via email. Authors are responsible for ensuring that their papers do not infringe any existing copyright. The J-HERD and NMSCST shall not be held responsible for any infringement related to publication of unoriginal and fraud- ulent articles submitted by the authors.

## Author Guidelines

Authors are advised to LOG IN and submit full papers through the online journal system (nmsc.edu.ph/ojs) of Northwestern Mindanao State College of Science and Tech- nology. Manuscripts should be prepared in English, the length of which should not be more than 4000 words, and file size not exceeding 5MB. All submissions will undergo first-level evaluation and plagiarism-grammarly review prior to double-blind refereeing process.

Submission of a research paper is understood to mean that it is a product of original work, not published in other publications, and is not

being considered for publication else- where. Journal shopping, publication of fraudulent data and other unethical practices will be grounds for withdrawal of an article published in the J-HERD. Violators will be required to refund the expenses incurred in the processing of the paper. The J-HERD and NMSCST shall not be held responsible for any infringement related to publication of unoriginal and fraudulent articles submitted by the authors.

**In preparing the Manuscript, the following should be observed:**

1. Organize the paper following these major headings: Title, Author(s) and Ad- dress(es), Abstract, Introduction, Conceptual Framework, Research Methodology, Results and Discussions, Conclusions, Acknowledgement and References. The References should substantially consist of articles published in current content-covered or peer-reviewed journals.

2. The entire manuscript double-spaced on a short white bond paper (8.5 x 11in) on one side only with 2.5cm margins all around using a Times new Roman font size of 12.

3. References, Acknowledgement, Table Titles, and Figure Legends should be typed- spaced. Number consecutively all pages, including title page, figures, and tables. Leave two spaces before and after the major headings and subheadings. Do not use footnotes, unless necessary for better comprehension.

4. Spell out acronyms or unfamiliar abbreviations when these are mentioned for the first time in the text.

5. Write the scientific names of species when it is first mentioned in the text and use the common name in succeeding references. Italicize scientific names.

6. Do not spell out numbers unless they are used to start a sentence.

7.Use the metric system only or the International System of Units. Use abbreviation of units beside numerals (e.g. 5m); otherwise spell out the units (e.g. Kilometers from here).

8. When preparing Tables and Figures, consider the journal's printed page of 5.75 in 8.5 in the reduction that will be necessary. Titles of Tables and Captions of Figures should be typed, double-spaced on a separate sheet.

Figures should consist only of simple line drawings, computer-generated graphics or good quality black and white photographs. Label of Figures should be of such a size so that these are still legible even after reducing the size by as much as 50%.

9. Cite references in the text as the author (year). Cite three or more authors as (first author et al. year); references in press as (author, in press). If two or more references are cited, arrange them by year, (e.g, Padua, 2012; Lapinig, 2013, River, 2016).

10. Cover page should show the title of the paper, all authors' names, titles and affiliations, email addresses, and any acknowledgements.

**Pagination**: All pages, including tables, appendices and references, should be seri- ally numbered. Major sections should be numbered in Hindu Arabic numerals. Sub-sections should not be numbered.

**Abstract**: An abstract of 100-250 words should be presented on a separate page immediately preceding the text. The abstract should concisely inform the reader of the man- uscript's topic, methods, findings and conclusions.

**Keywords**: At least three keywords must be provided right after the abstract to assist in indexing the paper and identifying qualified reviewers.

**Introduction**: An introduction provides more details about the paper's purpose, literature cited, gaps in knowledge, and how the paper intends to address the gap.

**Conclusions**: Conclusions should briefly answer the objectives of the study. These are not repetitioning of the discussion, but are the judgements of the results obtained.

**The article for publication must contain the following parts:**

-Title
-Abstract
-Introduction

-Conceptual Framework
-Research Methodology
-Results and Discussion
-Conclusions
-References

However, for the scientific papers, the following parts may be applied:

-Title
-Abstract
-Introduction
-Methods and Materials
-Results and Discussion
-References

Criteria for publication to be published in the Journal for Higher Education Research Disciplines:

A paper is required to meet the following guidelines:

-Intellectual Value
-Essential Impacts and Originality
-Critical Quality

# TABLE OF CONTENTS

# LOCALIZED APPARATUS AND INTERACTIVE COMPUTER SIMULATION IN TEACHING PROJECTILE MOTION

Joharaj A. Acabal[1], Brando A. Piñero[2], Maria Chona Z. Futalan[3]
*Foundation University, Dumaguete City*

*Volume 7, Issue No.1, January - December 2022*

***Abstract***

*This study aimed to determine the effectiveness of localized apparatus and computer interactive simulation in teaching projectile motion. It also intended to measure the interest of the students in using localized apparatus and computer interactive simulation. The respondents of this study were the Grade 9 students of Ali-is Integrated School during the school year 2019-2020. The researcher utilized the descriptive-correlational method of research and employed validated questionnaires that measured the performance of students and their attitudes toward physics lessons and experiments. The statistical tools used in this study included weighted mean, arithmetic mean, t-test for dependent and independent data, and spearman rho. The study revealed that there was an increase in students' performance after utilizing the localized apparatus and computer interactive simulation. It was also found that both groups of students had very high interest in both approaches and enjoyed the activities because of the utilization of localized apparatus and computer interactive simulation. Moreover, it was revealed that there was no significant relationship between the students' level of interest in localized apparatus and computer interactive simulation and their posttest performance. This means that their interest is not a determinant of their performance. In general, the localized apparatus and computer interactive simulation were found to be effective in improving the students' conceptual understanding of projectile motion, thus improving their performance.*

**Keywords:**

Localized apparatus, computer interactive simulation, level of interest, projectile motion, performance of the students, extent of conceptual understanding

## 1.0Introduction

Science has been important in the life of many people. It is the foundation upon which a lot of technological creations are built. Nowadays, nations all over the world are

striving hard to improve and develop technologically and scientifically especially that the world is becoming scientific and almost all human transactions depend greatly on science (S.A Onasanya, 2011).

Since science is essential to people's daily living, many policy makers all over the world have tried their best to develop and revise the science education by modifying the curriculum based on perception and by developing a new curriculum that will influence and help teachers to shift from their traditional practices in the classrooms and make students learn far better in Science (Cuban, 2012). Many places worldwide face challenges in science education (ICSU, 2011). For example, report from American Management.

Association states that students in the United States and Philippines have low achievement levels in science and mathematics TIMMS-R as compared to those in other countries like Singapore, Taiwan, Hungary, and Japan who got the highest scoring students (Global Math and Science Education Trends, 2015). Indeed, Filipinos' poor achievement levels in science have been documented for several years.

To cope with these challenges in science education, reforms in education are constantly being made. The K-12 curriculum was implemented through Republic Act 10533 also known as the "Enhanced Basic Education Act of 2013" (The Official Gazette, 2013). One of the key features of the K-12 Program is to strengthen Science and Math education which follows a spiral progression approach. The spiral progression approach is believed to strengthen retention and mastery of topics and skills since the lessons are revisited combined with increasing depth and complexity of learning in the succeeding grade levels with the aid of instructional materials especially in laboratory activities (Quijano and Technical Working Group on Curriculum, 2012). Sad to say, the inadequacy of laboratory facilities and science equipment has made learning science a burden. Instead of enjoying the concepts, students would find it boring and difficult because the topics are not relatable to them (Ramos- Samala, 2018).

The use of locally available materials is found to be one of the factors that can improve students' performance. This approach also allows the teachers to bring the lesson into reality with the use of inexpensive and locally available materials (Fakunle, 2010).

Teaching science, especially Physics, which is difficult to teach to students, is made simpler and clearer through the use of interactive simulation. Also, some experiments and activities which are hard for the students to understand in the classroom or in the laboratory

can also be simplified with the help of this simulation (Bozkurt & Ilik, 2010). Through this way, Science concepts become fun and immersing for the students.

Knowing these facts, the researcher was motivated to conduct a study about localized materials and computer interactive simulation to be utilized for demonstrating the concept of projectile motion. In this undertaking, the researcher devised a localized apparatus and a computer-based interactive simulation and used them to teach projectile motion to Grade 9 students. The objectives of the study were: a) to find out if there is a significant difference between the pretest performance and posttest performance of the students after using the localized apparatus and computer interactive simulation; and b) to determine the relationship between the students' level of interest and their posttest performance.

## 2.0 Conceptual Framework

The study focuses on the construction and use of localized apparatus and computer interactive simulation in the teaching of projectile motion. This would aid learners in understanding the concepts that are usually taught in the classroom in a conventional way. The progression of the study is visually presented in Figure 1 through the Input-Process-Output diagram. It begins with the input which entails the discussion about projectile motion. Next is the process stage, which includes the conduct of the pretest, the use of localized apparatus and computer interactive simulation, and then the posttest. Lastly, the output of the study covers the students' posttest results and their interest in localized apparatus and interactive simulation.

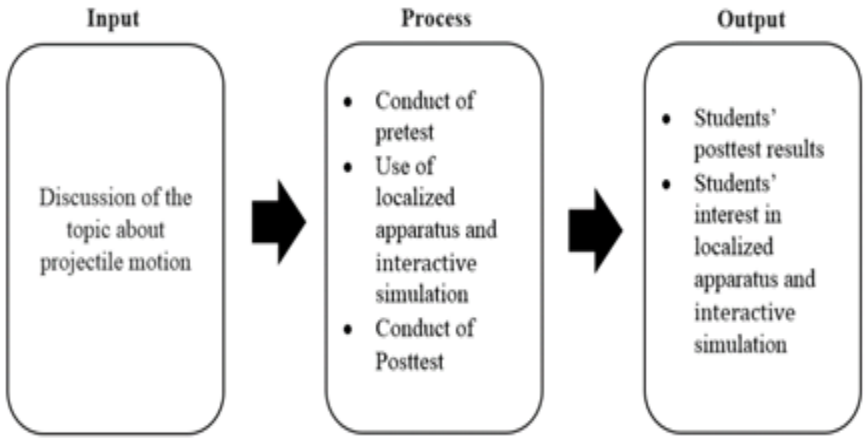


**Figure 1:** Conceptual Framework of the Study.

## 3.0 Methods and Design

*Research design*. This study utilized a descriptive-correlational type of design. It is descriptive because (1) it describes the pretest performance of the students before using the localized apparatus and interactive simulation and the posttest performance of the students; and (2) it describes the students' level of interest in using the localized apparatus and interactive simulation. It is also correlational because the students' interest in using localized apparatus and interactive simulation is correlated with their posttest performance.

*Research environment*. The conduct of this study was done at Ali-is Integrated School (AIS) in Ali-is, Bayawan City, Negros Oriental.

*Research subjects.* The subjects of this study were the 40 students enrolled in Grade 9 at Ali-is Integrated School for the School Year 2019-2020. The selection of the subjects was based on their 1st, 2nd and 3rd quarter grades. The upper group consisted of those students with the highest grades and who earned the ranks ranging from 1 to 20. The lower group consisted of students with the lowest grades and whose ranks ranged from 21 to 40. The students were divided into 8 groups, mixing the upper group and the lower group with 5 members per group. Each member was identified by the teacher based on the ranking and their Science performance. It was to make sure that the level of comprehension for both groups was similar.

There were 4 groups who performed the activity in projectile motion using the localized apparatus, while the other 4 groups utilized interactive simulation. The teacher randomly assigned the students to either localized group or interactive simulation group by picking up the numbers 1 and 2 (1 for localized apparatus and 2 for Interactive simulation).

*Research Instruments*

The researcher designed and constructed a localized apparatus that made use of locally available materials. The apparatus was used for the experiment meant to make students understand the concepts of projectile motion.

a. *Localizedapparatus*- made from locally available materials and were constructed at Ali-is Integrated School (AIS).

b. *Interactive simulation*- a software downloaded from Phet Colorado (phetcolorado.edu)

c. *Activity guides*- designed to guide learners and let them maximize the time in doing the activities. (refer to Joharaj A. Acabal 2019)

d. *Pretest and posttest questionnaire*- sets of questions

using a Table of Specification. (refer to Joharaj A. Acabal 2019)

e. *Questionnaires on students' interest*- questionnaire to measure student's interest in using localized apparatus and interactive simulation (based on the developed work of Kimberly Yucor(2018))

*Research Procedure*

Prior to the conduct of the study, a letter of request to conduct the study was sent to the Teacher-in-Charge of Ali-is Integrated School. After the letter was approved, the researcher presented the letter to the class adviser of the classroom where the study was conducted.

Prior to the conduct of the activity and the distribution of test questionnaires, the researcher explained to the students the purpose and importance of the research. Next, the researcher administered the pretest to the students using the pretest questionnaire. The researcher discussed a little about the introductory part of projectile motion concept before the respondents were asked to answer the items in the pretest.

Each group consisted of equal number of students coming from the upper group and lower group. The researcher then explained the procedures of the activity as well as the use of the localized apparatus and interactive simulation. The researcher let the students manipulate the apparatus and interactive simulation with the support of the activity guide. One hour was allotted for the students to perform the activity. Within this given time, the students performed the activity as instructed in the activity guide and answered the questions that were included in the guide. A posttest questionnaire was then given for the students to answer. After the posttest, the questionnaires intended to measure the interest of the students in using the two approaches were distributed. The results of the test and activity sheets were gathered and were computed. The results from the test and activity sheets were then analyzed and interpreted.

The proficiency level or academic performance at which the students were performing was based on the following criteria (DepEd Order No. 8, s 2015)

*Data Treatment*

*Percent.* This is used to show how a part is related to a whole. It was used in presenting the pretest performance of the students before using the localized and interactive simulation.

*Weighted mean.* This was used in getting the extent of students' interest in using localized apparatus and interactive simulation.

*Mean.* This was used to determine the performance of the students during their pretest and posttest.

It was also used to determine the extent of the students' interest in the use of localized apparatus and interactive simulation.

*The t-test for dependent data*. This was used to identify the significant difference between the pretest and the posttest performances of the students. This tool was utilized since the data are in ratio scale.

*The t-test for independent data.* This was used to evaluate the significant difference between the posttest performances of the students. This tool was used since the data are in ratio scale.

*Spearman rho*. This was used to determine the relationship between the interest of the students in using localized apparatus and interactive simulation and their posttest performance. This tool was appropriate since one of the variables (interest) is in ordinal scale.

The proficiency level or academic performance at which the students were performing was based on the following criteria (DepEd Order No. 8, s 2015)

## 4.0 Results and Discussion

This part of the study deals with the presentation, analysis, and interpretation of the data gathered. Questionnaires were administered to 40 Grade 9 students of Ali-is Integrated School.

The gathered data are presented in tabular and textual forms, analyzed, and interpreted to suit the problems presented earlier in this study.

## Results

**Table 1:** *Pretest Performance of the Students in the Concepts of Projectile Motion*

| Rating | Verbal Description | Localized Apparatus Group F | % | Interactive Simulation Group F | %\ |
|---|---|---|---|---|---|
| 90% - 100% | Outstanding | 0 | 0.00 | 0 | 0.00 |
| 85% - 89% | Very Satisfactory | 0 | 0.00 | 3 | 15.00 |
| 80% - 84% | Satisfactory | 3 | 15.00 | 4 | 20.00 |
| 75% - 79% | Fairly Satisfactory | 5 | 25.00 | 4 | 20.00 |
| Below 75% | Did Not Meet Ex. | 12 | 60.00 | 9 | 45.00 |
| Total | | 20 | 100.00 | 20 | 100.00 |
| Mean | | 75.25% (Fairly Satisfactory) | | 78.00% (Fairly Satisfactory) | |

Table 1 shows the pretest performance of the students before using localized apparatus and interactive simulation. As reflected by their average ratings, both groups are on the "fairly satisfactory" level, which means that students at this level possess the minimum knowledge and skills and core understanding of the concept of projectile motion although they still need help throughout the performance of authentic tasks.

| Rating | Verbal Description | Localized Apparatus Group | | Interactive Simulation Group | |
|---|---|---|---|---|---|
| | | F | % | F | %\ |
| 90% - 100% | Outstanding | 10 | 50.00 | 12 | 60.00 |
| 85% - 89% | Very Satisfactory | 10 | 50.00 | 7 | 35.00 |
| 80% - 84% | Satisfactory | 0 | 0.00 | 1 | 5.00 |
| Total | | 20 | 100.00 | 20 | 100.00 |
| Mean | | 92.00% (Outstanding) | | 92.8% (Outstanding) | |

**Table 2:** *Posttest Performance of the Students in the Concepts of Projectile Motion*

Table 2 shows the posttest performance of the students after using localized apparatus and interactive simulation. The data reflect that the localized apparatus group and interactive simulation group are on the outstanding level (92% and 92.80%, respectively). This clearly means that the students at this level exceed the core requirements in terms of knowledge, skills and understanding of the concept of projectile motion and that they only need little guidance from the teacher and/or some assistance from peers. It also means that the students can transfer these understanding through authentic performance tasks (DepEd Order No. 8, s 2015).

**Table 3:** *Analysis Table on the Difference between the Pretest and Posttest Performances of the Students*

| Group | n | Pretest | Posttest | D | t-value | p-value | Decision/Remark |
|---|---|---|---|---|---|---|---|
| Localized Apparatus | 20 | 75.25 | 92.00 | 16.75 | 18.86 | 0.000 | Reject $H_{01}$/Significant |
| Interactive Simulation | 20 | 78.00 | 92.80 | 14.80 | 15.62 | 0.000 | Reject $H_{01}$/Significant |

Level of Significance = 0.05

Table 3 indicates that there is a significant difference between the pretest and posttest performances of the students who are subjected to localized apparatus ($p = 0.000 < \alpha = 0.05$) in favor of their posttest performance. The data revealed that in terms of localized apparatus utilization in teaching projectile motion, a difference of 16.75% is apparent between the pretest and the posttest performances of the students. To evaluate the data statistically, t-test for dependent data is applied. This finding would allow rejection of the null hypothesis. This implies that the students' posttest performances are better than their pretest performances and this is attributed to the use of the localized apparatus.

**Table 4:** *Analysis Table on the Difference in the Posttest Performances of the Students*

| Group | n | Posttest | D | -t value | -p value | Decision | Remark |
|---|---|---|---|---|---|---|---|
| Localized Apparatus | 20 | 92.00 | | | | | |
| | | | 0.80 | 0.44 | 0.661 | Fail to reject $H_{02}$ | Not Significant |
| Interactive Simulation | 20 | 92.80 | | | | | |

Levels of significance = 0.05

Table 4 presents the difference in the posttest performances of the two groups of students. The data indicate that the p-value (0.661) is greater than the level of significance (0.05). This finding will not warrant rejection of the null hypothesis. This means that there is no significant difference between the posttest performances of the students using localized apparatus and interactive simulation. This implies that the effectiveness of the two approaches is more or less the same. As shown in the posttest, the results obtained by the two groups are quite close.

**Table 5:** *Level of Interest of the Students in Both Approaches in Teaching Projectile Motion*

| **Statements** | Localized Apparatus | | | Interactive Simulation | | |
|---|---|---|---|---|---|---|
| | WX | VD | Level | WX | VD | Level |
| 1. The use of localized apparatus and Interactive simulation in Science discussion is interesting. | 4.90 | SA | VH | 4.80 | SA | VH |
| 2. The localized apparatus and interactive simulation help me focus on the discussion and in the concepts about projectile motion | 4.80 | SA | VH | 4.80 | SA | VH |
| 3. The use localized apparatus/ interactive simulation makes me feel excited as to what I'm going to find out especially on the lesson about projectile. | 4.80 | SA | VH | 4.20 | A | H |
| 4. The activities made in the projectile motion made me realized that science would be more interesting with the use of localized apparatus and interactive simulation. | 4.70 | SA | VH | 4.40 | SA | VH |

| | | | | | | |
|---|---|---|---|---|---|---|
| 5. It made me realized that with the use of localized apparatus and interactive simulation, science concepts would be a lot more fun. | 4.70 | SA | VH | 4.30 | SA | VH |
| 6. The projectile motion is very fascinating to me because of the use of localized apparatus/interactive simulation. | 4.70 | SA | VH | 4.30 | SA | VH |
| 7. The use localized apparatus/ interactive simulation makes me listen attentively. | 4.50 | SA | VH | 4.40 | SA | VH |
| 8. I enjoyed sing the localized apparatus/ interactive simulation. | 4.35 | SA | VH | 4.20 | A | H |
| 9. The activities made me realize that Physics is not merely a set of formula that needs to be memorized. | 4.30 | SA | VH | 4.40 | A | H |
| 10.The activity encouraged me to use my skills in manipulating objects. | 4.20 | A | H | 4.35 | SA | VH |
| 11. I want to use this localized apparatus or interactive simulation in other concepts of Science. | 4.20 | A | H | 4.55 | SA | VH |
| 12. The use localized apparatus/ interactive simulation makes me feel curios about the nature of science. | 4.05 | A | H | 4.40 | SA | VH |
| Composite | 4.51 | SA | VH | 4.44 | SA | VH |

| **Legend:** | **Scale** | **Verbal Description** | **Attitude Interpretation** |
|---|---|---|---|
| | 4.21 – 5.00 | Strongly Agree (SA) | Very High (VH) |
| | 3.41 – 4.20 | Agree (A) | High (H) |
| | 2.61 – 3.40 | Moderately Agree (MA) | Moderate (M) |
| | 1.81 – 2.60 | Disagree (D) | Low (L) |
| | 1.00 – 1.80 | Strongly Disagree (SD) | Very Low (VL) |

Table 5 shows the result of the students' level of interest in localized apparatus and interactive simulation. It is shown that the students' level of interest is very high for both localized apparatus and interactive simulation with weighted means of 4.51 and 4.56, respectively. These values indicate that the learning of projectile motion was made interesting because of the use of localized apparatus and interactive simulation.

Table 6
**Table 6.** *Relationship between the Level of Interest of the Students and Their Posttest Performance*

| Variables | $r_s$ | p-value | Decision | Remark |
|---|---|---|---|---|
| **Localized Apparatus** | | | | |
| Level of Interest vs Posttest Performance | 0.252 | 0.277 | Fail to reject $H_{03}$ | Not Significant |
| **Interactive Simulation** | | | | |
| Level of Interest vs Posttest Performance | 0.403 | 0.078 | Fail to reject $H_{03}$ | Not Significant |

Level of Significance = 0.05

Table 6 shows that there is no significant relationship between the students' level of interest in using localized apparatus and their posttest performance. This means that students' level of interest is not considered a determinant of their posttest performance since the p-value is greater than the level of significance ($p=0.277 > \alpha = 0.05$). This may be because the students' level of interest as shown in Table 5 is already very high and based on the raw data, their individual interests are categorized within very high and high interest. This implies that regardless of the level of the interest of the students, their performance is the same.

## 5.0 Discussion

The primary focus of the study was to determine the performance of the learners using localized apparatus and interactive simulation in teaching projectile motion at Ali-is Integrated School (AIS) for the School year 2019-2020. With this, the researcher would be able to reveal if there if there is a significant difference between the pretest performance and posttest performance of the students after using the localized apparatus and interactive simulation and be able to determine the relationship between the students' level of interest and their posttest performance.

The students possess the minimum knowledge and skills and core understanding of the concept of projectile motion, although they still need help throughout the performance of authentic tasks. They showed marked improvement in their posttest after the use of two interventions. This finding is supported by Olagunju (2000) and Nwike (2013), who disclosed that the students' performance showed a positive result after being subjected to an intervention activity.

Further, there is no significant difference in the posttest

performances of the students using localized apparatus and interactive simulation. This result is supported by David Kolb's experiential learning theory, which emphasizes that students' knowledge is created through the transfer of experiences. In the current study, when students actively participated and cooperated in the manipulation of activities using localized and interactive simulation, they gained new experience. The concrete experiences that they had helped them eliminate the misconceptions and negative perceptions of the concept of projectile motion, which led them to understand the concept better and improve their performances.

On the other hand, the level of interest of the students in using localized apparatus and interactive simulation is at the same level. The results have similarities to the studies of Sinco's (2018) and Potaye and Bayete's (2018), where students claimed that they find the improvised materials interesting and enjoyable, and computer-based activities do not only improve the knowledge and skills of the learners but also provide fun and enjoyment.

## 6.0 Conclusion

Learning of projectile motion was made interesting because of the use of localized apparatus and interactive simulation. After undergoing both intervention activities, students' grasp of the fundamentals of projectile motion improved, but using localized apparatus produced better results.

## REFERENCES

Adebule, S., & Ayoola, O. (2015). Impact of Instructional Materials on Students'Academic in Mathematics in Secondary Schools in Ekiti State, Nigeria. Pearl Research Journals, 1-4.

Acabal, Joharaj (2019) Localized Apparatus And Interactive Computer Simulation In Teaching Projectile Motion, Unpublished thesis, Foundation University, Dumaguete City

Adedayo, J. O. (2018). Validating the Use of Improvised Materials in Determining the Value of Acceleration due to Gravity. Journal of Scientific and Engineering Research, 2018, 5(4), 1-6.

Balbon, A. N. (2019). Localized Apparatus in Teaching Geometrical Optics. Dumaguete City.

Betrancourt, M. (2005). The animation and the interactivity principles in multimedia leaning. In R.E Mayer (Ed). The Campbridge handbook of multimedia learning. New York: Cambridge University Press.

Bozkurt, e., & Ilik, A. (2009). The effect of computer simulations over students belief on physics and physics success. Procedia Social Behavior Sciences 2(2010), 4587-4591.

Bozkurt, E., & Ilik, A. (2010). the effect of computer simulations over students' beliefs on physics and physics success. Procedia Social and Behavioral Sciences 2, 4587-4591.

Bromage, B. K., & Mayer, R. E. (1981). Relationship between what is remembered and creative problem solving performance in science learning. Journal of Educational Psychology, 73, 451-461.

Chang, K. E., Chen, Y. L., Lin, H. Y., & Sung, Y. T. (2008). Effects of learning support in simulation-based physics learning. Computers & Education, 51(4), 1486-1498.

C. Even1, C. B. (n.d.). Learning through experimenting: an original way of teaching geometrical optics.

Chegg.com. (2003). Chegg. Study Textbook solution. Retrieved from https://www.chegg.com/homework-help/definitions/projectile-motion-2

Dahar, M. (2011). the effect of the availability and the use of instructional materials on academic performance of students in Punjab (pakistan. Euro Journal Publishing.

DepEd. (2016, August). K to 12 Curriculum Guide. Retrieved from Deped.gov.ph: https://www.deped.gov.ph/wp-content/uploads/2019/01/Science-CG_with-tagged-sci-equipment_revised.pdf

DO 45, s. 2013 - Guidelines on the Provision of Science and Mathematics Equipment for Fiscal Year 2013. (2013,

October 7). Retrieved August 20, 2017, from Department of Education: http://www.deped.gov.ph/orders/do-45-s-2013

Heller, J. I., & Reif, F. ((1984)). rescribing effective human problem-solving processes: Problem description in physics. Cognition and Instruction, I, 177-216.

Helmenstine, A. M. (2019, September 8). ThoughtCo.com. Retrieved from https://www.thoughtco.com/difference-between-accuracy-and-precision-609328

Jimoyiannis, A., & Komis, V. (2001). Computer simulations in physics teaching and learning: a case study on students' understanding of trajectory motion. Computers & Education 36 (2001) 183-204, 183-204.

JL. (2017). Experiential Learning (Kolb). Learning Thoeries.

Kelly, C. (1997). David Kolb, The Theory of Experiential Learning ans ESL. The Internet TESL Journal, Vol III No.9.

Kolb, A. Y., & Kolb, D. A. (2011). Experiential Laerning Theory: A dynamic, holistic approach to management learning, education and development. In Armstrong, S. J. & Fuka mi, C. (Eds.) Handbook of management learning, education and development.

Kolb, D. (2007). Kolb's Experiential Learning Cycle. Retrieved from University of Leicester: https://www2.le.ac.uk/departments/doctoralcollege/training/eresources/teaching/theories/kolb

Konak, A. C. (2014). Using Kolb's Experiential Learning Cycle to improve student learning in virtual computer labora tories. In A. C. Konak, Computers and Education (pp. 11-12).

Matthew C. Nwike (2013). Effects of Use of Instructional Mate rials on Students Cognitive Achievement in Agricultur al Science Federal College of Education(Technical), Umunze-Anambra State,

Nigeria Onyejegbu Catherine Department of Natural Science School of General Studies Federal Polytechnic, Oko-Anambra State, Nigeria. Journal of Educational and Social Research Vol. 3 (5).

Mayer, R. E., & Chandler, P. (2001). When learning is just a click away: Does simple user in teraction deeper under standing of multimedia mes sages? Journal of Education al PPsychology, 93(2), 390-397.

Menditto, A., Marina, P., & Magnus son, B. (2006). Understanding the meaning of accuracy,trueness and precision. Accreditation and Quality Assurance 12(1), 45-47.

National Research Council. (2011). Learning science through computer games and simulations. National Academies Press.

Nwike, M. C., & CAtherine, O. (2013). Effects of Use of Instructional Materials on Students Cognitive Achievement in Agricultural Science . Journal of Educational and Social Research , 104-107.

Okori, O. A., & Jerry, O. (2017). Improvisation and Utilization of Resources in Teaching and Learning of Science and Mathematics in Secondary Schools in Cross river State. Global Journal of Educational Research Vol 16, 2017: 21-28, 21-28.

Oladejo, M. A., Olosunde, G. R., Ojebisi, A. O., & Isola, O. M. (2011). Instructional Materials and Students' Academic Achievement in Physics: Some Policy Implications . European Journal of Humanities and Social Sciences Vol. 2, No.1 (2011) , 113-126.

Oladejo, M. A. (2011). Instructional Materials and Students' Academic Achievement in Physics: Some Policy Implications. European Journal of Humanities and Social Science.

Olayinka, A.-R. B. (2016). Effects of Intructional Materials on Secondary Schools Students' Academic Achievement in Social Studies in Ekiti State Nigeria. World Journal of Education, 32-39.

Omari, T., & Chen, V. (2016, August 29). What is Conceptual Understanding. Retrieved from https://www.gettingsmart.com

Opertti, R., & Amadio, M. (2010). Training Tools for Curriculum Development. Retrieved from United Nations Educational, Scientific and Cultural Organization: http://www.ibe.unesco.org/fileadmin/user_upload/COPs/Pages_documents/Resource_Packs/TTCD/TTCDhome.html

Patron, B. (2017). Tnexpensive demonstrations and experiments in fluid mechanics.

Potane, Joel and Bayeta, Rodolfo Jr, Virtual Learning Through PhET Interactive Simulation: A Proactive Approach in Improving Students'Academic Achievement in Science (April 21, 2018). Available at SSRN: https://ssrn.com/abstract=3166565 or http://dx.doi.org/10.2139/ssrn.3166565

Projectile Motion: Definition and Examples. (2019). Retrieved from Study.com: https://study.com/academy/lesson/projectile-motion-definition-and-examples.html

Pyatt, K., & Sims, R. (2012). Virtual and physical experimentation in inquiry-based science labs: Attitudes, performance and access. Journal of Science Education and Technology, 21(1), 133-147.

Ramos-Samala, H. d. (2018). Spiral Progression Approach in Teaching Science: A Case Study. Retrieved from KNE Publishing:https://knepublishing.com/index.php/Kne-Social/article/view/2404/5286

Robertson, W. C. (1986). Measurement of conceptual understanding in physics: Predicting performance on transfer problems involving Newton's second law. Doctoral Dissertation, University of Colorado.

Robertson, W. C. (2019). Teaching Conceptual Understanding to Promote Students' Ability to do Transfer Problems. Research Matters- to Science Teacher.

Salviejo, E. I. (2014). Strategic intervention material-based instruction, learning approach, and students' performance in chemistry. International Journal of Learning, Teaching, and Educational Research Vol. 2, No. 1, 91-123.

S.A Onasanya, O. E. (2011). Effects of improvised and standard Instruction al Materials on Secondary school Studet's Academic Performance in Physics in Ilorin, Nigeria. Singapore Journal of Scientific Research 1, 68-76.

Sinco, M. (2018). STRATEGIC INTERVENTION MATERIAL. Dumaguete City: Foundation University.

Thesaurus. com. (n.d.). Retrieved from https:// www.dictionary. com/browse/apparatus

Ugbe, A., & Dike, W. J. (2012). Comparative Effect of Using Improvised Freefall Appratus and Bomb Calorimeter in teaching the concept of enthalpy in Nigeria Senior Secondary School Chemistry. World J Young Researchers 2012;2(2):35 , 35-39.

Widiyatmoko and Shimizu. (2018). An overview of conceptual understanding in science education curriculum in Indonesia. Journal of Physics: Conference Series.

Widiyatmoko, A., & Shimizu, K. (2017). An overview of conceptual understanding in science education curriculum in Indonesia. Journal of Physics, 1-6.

Yucor, K. J. (2018). Localized Appratus and Mobile Application in Teaching Cosine Laws. Dumaguete City: Foundation University.

Zarewa, H.O. (2005). Towards the successful universal basic education

implementation through the use of locally sourced materials in the teaching and learning of basic concepts inn integrated sciences. African Journal of Materials and Natural Resources, 1(1), 153