

Robots in Sixth Grade Physical Education Class and Exercise:
A Mixed Methods Approach
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Chapter 1 Introduction

Introduction

Obesity is a growing issue among children in middle school (Office of Disease Prevention and Health Promotion, 2019). Children are not doing enough exercise to help control the weight issue. Obesity is one of the primary reason why middle-grade students drop out of organized sports (Brubaker, 2011). It is imperative for students to achieve a healthy lifestyle so that overall minds improve as well.

Physical education is essential for the well-being of the student and society as a whole. Physically active students have better coordination, reaction, movement skills (Office of Disease Prevention and Health Promotion, 2019). Also, it known for other benefits including increasing life expectancies (American Heart Association, 2019). American Heart Association (2019) recommends a guideline for students to eating a healthy diet and exercise regularly.

Statement of the Problem

Obesity leads to health complication issues that need addressing so that students are aware of the consequence. Many students lack the requirement of physical activities to stay healthy and well-being since they are spending more time on the screens of their technological devices. Schools are doing their best to encourage students to exercise and to stay in shape. A study of literature shows the positive results with the use of robotics to engage students with their academic performance, but no research has been done to connect the opportunity of robotics in physical education class to encourage students to exercise and stay in shape.

Purpose

The purpose of the mixed methods study is to evaluate the role of robotics in the physical education of middle-grade students and. A parallel convergent mixed methods design uses for this research. “This research design involves the collection and analyzing of two parallel strands of data independently where they later come together during the interpretation” (Creswell & Plano Clark, 2018). The researcher will examine two types of data of the same phenomenon, one data set will be quantitative, and the other qualitative, and two sets of independent results are brought together to be combined or compared during the examination (Creswell & Plano Clark, 2018).

Research Questions

Research Questions 1. (Quantitative) How many six-grade students think that the use of robots in physical education motivates them to exercise more?

Research Question 2: (Qualitative) What is the function of the robots of a sixth-grade physical education class?

Research Question 3: (Mixed methods) Does playing with robots in physical education class help to increase student interest to stay in shape?

Limitations

Some limitations of this study include the difficulty to concentrate due to the noisy atmosphere of the observed gym environment and the distraction coming from the students performing the exercise. “The researcher will need to give equal opportunity for both quantitative and qualitative data since both sets of data are collected simultaneously” (Creswell, 2015). Also, “the challenge to merge two different sets of data, one of which is of text and the other one is of numeric” (Creswell & Plano Clark, 2018). Furthermore, there are issues of

different sample sizes; the issue arises when collecting data for various purposes (Creswell & Plano Clark, 2018).

Chapter 2 Literature Review

Introduction

This literature review will cover the importance of having physical education for middle-grade students and why it is essential to address it due to the growing concern of obesity among society. Also, the researcher will discuss different theories of exercise behaviors. An analysis is of the educational benefits coming from the robotic use in educational settings; how this success can also translate to the benefit from the use of robotics in physical education, where current research study needs to be done on the use of robots in physical education among middle-grade students.

Obesity

Obesity is a growing concern for society as a whole. Students are dealing with the issue due to unhealthy lifestyle and eating habits, the lack of physical activity due to the rising of students spending more time than ever staring at screens of their mobile devices. On average in 2015, tweens are spending more than 4.5 hours per day on their screens, a significant rise over the past four years (Fottrell, 2018). Students are no longer interested in going out and running around. The importance of regular exercise should part of an individual's physical activity (Office of Disease Prevention and Health Promotion, 2019). "There is evidence that physically active individuals sleep better, feel better, and function better" and "physical activity reduces the risk of a large number of diseases and conditions" from the 2018 physical activity guidelines advisory committee scientific report (Office of Disease Prevention and Health Promotion, 2019).

Theories of Exercise Behavior

Biddle & Nigg (2000) explain “the behavioral epidemiology framework advocated by Sallis and Owen (1999), this framework is useful in viewing various processes in the understanding of physical activity and health” (p. 537). First, the belief-attitude approaches, “attitude is one of important construct in social psychology, where attitudes predict behavior (Wicker, 1969), the presentation of an effective attitude item to which a person responds positively may affect his or her response to an instrumental attitude item presented subsequently” (Biddle & Nigg, 2000, p. 538).

Second, “the theory of reasoned action (TRA) (Ajzen & Fishbein, 1980), is a popular social cognitive model that incorporates attitudes in a belief-based framework aimed at explaining behavioral intentions, intention indicates the degree of planning and effort people are willing to invest in their performance of future behavior” (Biddle & Nigg, 2000, p. 539).

Although “TRA does not explain all behaviors, Ajzen (1985) notes another theory of planned behavior (TPB), the intention is a central determinant of social behavior and a function of attitudes and subjective norms with corresponding behavior beliefs and normative beliefs” (Biddle & Nigg, 2000, p. 540).

Academic Differences of Students Involved in School-Based Robotics Programs

Koumoullou (2013) tries to identify the correlation between high school students' participation in after-school robotics program and their academic performance. The research involves an examination of grades and attendance of students who participated in the after-school robotics program between the year of 2011-2012 (Koumoullou, 2013). These observed records compared to students who participate in after-school sports teams, and another comparison to students who did not belong to either of the first two groups mentioned (Koumoullou, 2013). Also, “the researcher ran MANOVs, repeated measures analyses, an

ANOVA, and descriptive statistics to analyze the data” (Koumoullou, 2013). The study concluded that students who participated in the after-school robotics program performed higher in academic scores compared to the other two groups (Koumoullou, 2013).

VBOT: Computational fluencies with constructionist virtual / physical robotics

Berland (2008) tries to evaluate and compare different activities that promote the growth of computational and complex systems fluencies among middle –school students through the use of collaborative constructionist virtual and physical robotics. “Students who collaborative through discussion and sharing with their team improve their skills in computational and complex systems with the abilities to produce relevant content (DiSessa, 2000)” (Berland, 2008).

From this research study, the importance of collaborative play and computer programming to increase computational fluencies among middle-grade students (Berland, 2008). Berland (2008) presents “the design of the VBOT virtual/physical constructionist robotics learning environment and the interaction among the students as a reinforcement idea behind the increase in computational and complex systems fluencies.”

LEGO-based Robotics Platform for a 3rd Grade Classroom

Noble (2013) introduces “LEGO-based robotics as a learning tool for third-grade students to understand engineering concepts through project-based learning and open-ended design challenges.” Two versions of LEGO used to perform the project-based learning include LEGO MINDSTORMS NXT and the WeDo; and the students used Apple iPad to program the devices (Noble, 2013). The objective is to understand the concept of programming and the importance of learning the idea so students can have the flexibility to create their application later on in life.

Summary

The literature review covers the importance of physical education among middle-grade students to combat ongoing obesity issues among society and the importance of having a healthy lifestyle to feel upbeat, to think better, and to efficiently function as part of the member in society. Also, the use of robotics in educational settings proved to improve academic performance for students who enrolled in robotics programs. However, there is no researcher out there to draw the same conclusion with the use of robotics in physical education class to promote the growth of the mind and the wellness of the body.

Chapter 3 Methodology

Introduction

The use of the parallel convergent mixed methods design (Creswell & Plano Clark, 2018) is to understand and evaluate robotics in physical education among sixth-grade students. The study will find out whether robotics will or not play an integral part in getting middle-grade students interested in physical education. As society becomes more technologically advanced, students are spending more time on their screens instead of doing more physical activities which promote the wellness of the body and mind. As students become attached to their screens, the risk of obesity and other health-related issues arise. The study will evaluate whether or not the robotics will help to get middle-grade students interested in physical education and the last effects beyond the classroom. Also, the research involves questionnaires, surveys, and interviews of middle-grade students engaged in physical education.

Research Design

The research design involves a parallel convergent mixed methods study (Creswell &

Plano Clark, 2018) and it is the best design to answer the research questions proposed. “The researcher intends to bring together the results of the quantitative and the qualitative data analysis so they can be compared or combined” (Creswell & Plano Clark, 2018, p. 65). “The idea behind the design is to validate one set of findings with the other and to determine if participants responded similarly if they check quantitative predetermined scales and if they are asked open-ended qualitative questions” (Creswell & Plano Clark, 2018, p. 65).

Population & Sample

The population for both the qualitative and quantitative phases for this research will come from the six-grade students who range from 11 to 12 years old coming from an urban middle school location with a total middle school population of over 175.

The observation involves physical activities performed by participants during the physical education class. Participants included 45 sixth grade students who matched the criteria from an urban middle school in northern New Jersey.

Creswell & Plano Clark (2018) state a sample of 20 to 30 participants will be sufficient to cover the in-depth information for the mixed methods study. The data collection for this study involves two groups; the treatment group has robots guiding along with their physical activities, while the control group received only physical activities instruction from the coach.

Procedures

The steps are taken to conduct the study: First, identify the research design that will help to answer the research problem (Creswell, 2015), for this study it will be a parallel convergent mixed methods design. Second, gather appropriate approvals including permissions from parents

of minor since the participants are sixth graders. Permission form distributed to parents and signed by them granting their children to participate in the study (Appendix A). Participation was voluntary and students can request to be removed from the study at any time. All data collected are kept confidential and a coding system used to keep the students anonymous. Third, obtain IRB permission from NJCU (Appendix B). Fourth, obtain site permission from the Jersey City Board of Education to use PS #5 (Appendix C) for the study. Fifth, simultaneously collected the quantitative and qualitative data (Creswell & Plano Clark, 2018) for over four days. Each day will cover two sixth grader gym class one in the morning and the other one in the afternoon. For quantitative collection: data source will be from the Exercise & Robotics Surveys (Appendix D) will administer to the participants during the date of the program. For qualitative collection, the data source will be from open-ended focus group interviews that will audiotaped and transcribed (Appendix E). Then, “the researcher analyzes the survey data quantitatively and the focus group interview qualitatively and then compare the two sets of results for converge and diverge” (Creswell & Plano Clark, 2018).

Table 1

Research Questions, Data types, and Data Source

<u>Research Question</u>	<u>Data Type</u>	<u>Data Source</u>
How many six-grade students think that the use of robots in physical education motivates them to exercise more?	Quantitative	Exercise & Robotics Surveys (Appendix D)
What is the function of the robots of a sixth-grade physical education class?	Qualitative	Open-Ended Focus Group Interviews (Appendix E)
Does playing with robots in physical education class help to increase student interest to stay in shape?	Quantitative	Exercise & Robotics Surveys (Appendix D)
	Qualitative	Open-Ended Focus Group Interviews (Appendix E)

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Appendix A

Consent Letter

Dear Parent/Guardian:

I am a doctoral student from New Jersey City University (NJCU), located in Jersey City, NJ. I am conducting my dissertation research at PS #5 located at Jersey City, New Jersey. The focus of my research is to examine the relationship between robots and sixth grade physical education class.

I am seeking your permission for your child to participate in the survey and interview. While performing the research study, all school policies followed and the information collected would be kept confidential.

Your child has the right to discontinue the participation at any time of the research project. If you have any additional questions before the study, please ask for clarification. Thank you for your assistance.

Steven Wong
Doctorate Student

I grant permission my child _____ to participate in the research study.

Please sign below.

Parent's or Guardian's Signature

Appendix B

NJCU IRB Review & Approval

Appendix C:**Letter of Permission to Jersey City Board of Education to use PS #5**

Mr. Franklin Walker
Acting Superintendent
JCBOE Administration Bldg.
346 Claremont Avenue
Jersey City, NJ 07305

Dear Mr. Walker:

I am a doctoral student from New Jersey City University, located in Jersey City, NJ. I am conducting dissertation research to examine the relationship between robots and sixth grade physical education

I am asking permission to research at PS#5, Jersey City, NJ. I will follow all policies set by the school and will share the findings from the research with the JCBOE. If this is an acceptable proposal, please reply to my email at swong@njcu.edu. I am looking forward to hearing from you. Thank you.

Sincerely,

Steven Wong

Doctoral Student

Appendix D

Youth Physical Activity Questionnaire

Template available at <http://www.mrc-epid.cam.ac.uk/wp-content/uploads/2014/08/YPAQ.pdf>

Letter of permission to use and to modify according to my study.

University of Cambridge
MRC Epidemiology Unit
University of Cambridge
The Old Schools
Trinity Lane
Cambridge
CB2 1TN
United Kingdom
Telephone: +44 (0)1223 337733

Dear Sir/Madam:

I am a doctoral student from New Jersey City University, located in Jersey City, NJ. I am conducting dissertation research to examine the relationship between robots and sixth grade physical education

I am asking your permission to use your Youth Physical Activity Questionnaire and to modify it accordingly to my research needs. I will send you the modified draft for your review.

If these are acceptable terms, please email me back at swong@njcu.edu.

Sincerely,

Steven Wong
Doctoral Student

Appendix E

Sample Interview Questions

1. Which exercise interest you the most and why?
2. What is your take on the use of robots in physical education class?
3. How do you feel about the robots?
4. What different forms of exercise do you get involved with?