Effects of Computer-Based Training in Computer Hardware Servicing on Students' Academic Performance

Rex Perez Bringula, University of the East, Philippines*

iD https://orcid.org/0000-0002-1789-9601

John Vincent T. Canseco, University of the East, Philippines

Patricia Louise J. Durolfo, University of the East, Philippines

Lance Christian A. Villanueva, University of the East, Philippines

Gabriel M. Caraos, University of the East, Philippines

ABSTRACT

This study determined the effects of computer-based training in computer hardware servicing with a pedagogical agent named "DAC: The Builder" on the academic performance of computing students. Fifty-six university students (30 students in the control group, 26 students in the experimental group) participated in a two-week experiment. The majority of the experimental group exhibited gaming behavior but subsequently reduced it after DAC intervention. The data collected in this study showed that the null hypothesis stating that there is no significant difference in the pretest and posttest scores of the experimental group can be rejected. Moreover, the hands-on posttest scores of both groups had significant differences. This study demonstrates that returning students to the lecture when they exhibit gaming the system behavior is an effective tool for discouraging this behavior. The use of the DAC is therefore recommended for students taking up computer hardware servicing. Implications and recommendations were also discussed.

KEYWORDS

Computer Hardware Assembly, Gaming the System, Hardware Servicing Skill, Tutoring System

1. INTRODUCTION

Computer hardware servicing is a technical skill where students have to learn computer set building, computer troubleshooting, software installation, system configuration, and computer maintenance (De Jesus, 2019). From basic secondary school to computer-related courses in tertiary education, computer hardware servicing instructions are a fundamental skill in computer education (Hsu & Hwang, 2014). However, there are challenges to learning the course. The difficulty experienced by students in assembling a computer is not only due to a lack of practice but also to insufficient assistance and

*Corresponding Author

materials (Hwang et al., 2011). For example, to understand the functions of a motherboard, students need to see a fully functional motherboard. The ideal teaching method for the subject is to allow the students to use a functional motherboard. However, it will be highly impractical to dismantle a working computer to show the motherboard. Moreover, providing individualized feedback to all students will be very tedious and time-consuming (Botarleanu et al., 2018).

One way to address these issues is to employ computer-based training (CBT) software (subsequently referred to as software) for a computer hardware servicing system (De Jesus, 2019). However, prior work (e.g., De Jesus, 2019) did not include interventions when students are gaming the system (GTS) (a deliberate behavior to exploit the system to achieve correct responses rather than learning the materials; Baker et al., 2008) and assistance from a pedagogical agent. To address these gaps, this study was conceived. This study developed software for computer hardware servicing for computing students (Information Technology, Computer Science, and Information Systems) with a pedagogical agent capable of detecting the GTS. Specifically, the study aims to answer the following research questions (RQ). 1) What is the software utilization of the students in the experimental group in terms of the number of lectures taken, time spent on the hands-on activities, number of hands-on errors, time spent gaming the system, and lesson where GTS was observed? 2) What are the hardware servicing academic performances of the students in the control and experimental groups in terms of pretest scores, posttest scores, time spent on the hands-on activities, and number of hands-on errors? 3) Is there a significant difference between the academic performances of the students in terms of pretest scores, posttest scores, time spent on the hands-on exercises, and number of hands-on errors in the control and experimental groups?

The following null hypotheses were tested in this study:

H_{0a}: There is no significant difference in the pretest scores of the experimental and control group.
H_{0b}: There is no significant difference in the posttest scores of the experimental and control group.
H_{0c}: There is no significant difference in the time spent on the hands-on activities of the experimental and control group.
H_{0d}: There is no significant difference in the number of hands-on errors committed of the experimental and control group.
H_{0e}: There is no significant difference in the pretest and posttest scores of the students in the control group.
H_{0f}: There is no significant difference in the pretest and posttest scores of the students in the experimental group.

2. LITERATURE REVIEW

2.1 Computer-Based Training

Computer-based training (CBT) is a methodology for providing systematic, structured learning (Bedwell & Salas, 2010). Practitioners and students could have relied on CBT (Bedwell & Salas, 2010) since it is an effective educational tool (Oduma et al., 2019). CBT is an evolving field. Researchers in this field are continuously developing CBT software with the intention of improving the students' academic performance. For instance, CBT was employed to learn languages. Ecalle et al. (2020) used CBT programs to stimulate learning to read in French for new immigrant children. Two groups of students used different CBT software programs. The first group has just started to learn French, while the second group could already identify a few French words. The experiments showed that there was a significant effect on phonemic awareness in the first group, while there was a significant effect on word reading in the second group. CBT for language acquisition is also beneficial for the older population. In a recent similar study, Klimova (2021) conducted a mini-review of the benefits of CBT for foreign language training in healthy older people. Klimova (2021) disclosed that CBT for foreign language acquisition was indeed helpful for older individuals.

11 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage: www.igi-global.com/article/effects-of-computer-based-training-in-computer-hardware-servicing-on-students-academic-performance/317410

Related Content

Computational Thinking and Mathematics: Possible Relationships Revealed by an Analysis of National Curriculum Guidelines
Thiago Schumacher Barcelosand Ismar Frango Silveira (2014). *Handbook of Research on Education and Technology in a Changing Society (pp. 922-934).*
www.irma-international.org/chapter/computational-thinking-and-mathematics/111898

The Mechanism of Flipped Classroom Based on Cognitive Schemas
Wangyihan Zhu (2023). *International Journal of Technology-Enhanced Education (pp. 1-12).*
www.irma-international.org/article/the-mechanism-of-flipped-classroom-based-on-cognitive-schemas/325077

The Impact of Language Use and Academic Integration for International Students: A Comparative Exploration Among Three Universities in the United States and Western Switzerland
Michelle L. Amosand Rachel C. Plews (2019). *International Journal of Technology-Enabled Student Support Services (pp. 1-13).*
www.irma-international.org/article/the-impact-of-language-use-and-academic-integration-for-international-students/244207

Competitive Advantage and Student Recruitment at a Namibian University: A Case Study
Booysen Sabeho Tubulingane (2020). *International Journal of Technology-Enabled Student Support Services (pp. 1-19).*
www.irma-international.org/article/competitive-advantage-and-student-recruitment-at-a-namibian-university/270260

Correlation of University Lecturer Leadership Styles, Students Satisfaction, and Learning Outcomes During the COVID-19 Pandemic
Wenwen Cao (2022). *International Journal of Technology-Enhanced Education (pp. 1-17).*
www.irma-international.org/article/correlation-of-university-lecturer-leadership-styles-students-satisfaction-and-learning-outcomes-during-the-covid-19-pandemic/308468