

Leveraging Six Sigma Tools to Improve Student Performance in Technical Courses at Secondary School

Miza Liyana Taha Sulaiman, Muhammed Nafis Osman Zahid

Faculty of Manufacturing and Mechatronic Engineering Technology, Universiti Malaysia Pahang,
26600, Pahang, Malaysia
nafis@ump.edu.my

Abstract: The goal of this study is to analyze student performance, improve *Reka Bentuk Teknologi (RBT)* course for Form 3 students using Six Sigma tools and to identify root causes of performance and make recommendations for improving results at one of the secondary school in Johor. According to an analysis conducted, the subject committee is looking forward to the number of students who will get Grade B and attend the examination for this subject in the final examination increasing by the end of the school session. To improve student performance in the RBT course, this paper employs various quality improvement tools during the Define, Measure, Analyze, Improve, and Control (DMAIC) phases. The study elucidates the causes of students' Mid-term examination results and enables recommendations to be made to improve student performance in RBT course. Six Sigma tools such as the Cause and Effect Diagram (Fishbone Diagram), Pareto Chart, and Quality Function Deployment (QFD) have been successfully adopted as quality tools during the improvement phase to make recommendations for improving student performance in technical courses. This research study also assists the course committee and school administration in learning more about the problems that students face and the improvement plans that they can implement in order to improve students' grades and interest in the course. Therefore, this research study is to improve students' grades and exam attendance, analyze student understanding in each chapter, and solve problems that arise by using the QFD tool.

1. Introduction

Six Sigma is a set of strategies and tools for process improvement created in 1986 by an American engineer called Bill Smith with the goal of improving all activities or processes that interact with customer demands and expectations [1]. Six Sigma is defined as 3.4 defects per million opportunities (DPMO), which improves customer satisfaction. The sigma rating is used to track progress toward a goal. It standardizes academic growth as a percentage increase in the end result. Six Sigma is used in education to improve the quality of information taught, student character, and the quality of study and school life. For instance, with the revolutionary use of audio-visual equipment, a discussion on the subject can be held [2].

One of the two key approaches used in Six Sigma is Define, Measure, Analyze, Improve, and Control (DMAIC). The DMAIC method is most commonly used to improve current business processes. The second method is DMADV, which stands for Define, Measure, Analyze, Design, and Verify. The DMADV method is commonly used to develop new processes as well as new products or services [3]. When a product or process already exists but its performance is unsatisfactory, DMAIC is a common improvement initiative [4]. Many Six Sigma management tools, such as statistical process control and failure mode and effects analysis, can aid in the construction of a long-term, higher-quality educational process [5]. For the education case study, a process map was created and presented that included

Supplier, Input, Process, Output, and Control (SIPOC), cause and effect analysis, and QFD. Secondary school teachers can use these resources to gain a better understanding of the educational process and how it may be improved to satisfy quality objectives

In conjunction with the fourth industrial revolution, Malaysian Higher Education has established an education 4.0 program. The goal of the education 4.0 program is to provide graduates with the talents and skills that the industry requires [6]. The subject of *Reka Bentuk & Teknologi (RBT)* has replaced the course of *Kemahiran Hidup Bersepadu (KHB)*. Significant changes have been made in terms of learning standards, which are now more focused toward design ideas, the utilization of cutting-edge manufacturing technologies, more structured problem-solving approaches, and project production. The new RBT curriculum is considered as having the ability to provide students with the knowledge and skills required in today's environment. The Ministry of Education instills the ambition and motivation to improve their academic performance in order to help Malaysia become the top group in the world (Ministry of Education Malaysia 2013) [7].

The purpose of the research is to improve student performance in technical courses in secondary school specifically for RBT courses. RBT is a secondary school elective course where the enrolment is selective and not compulsory to all students [8]. This study aims to eliminate or minimize the failure of student understanding in specific topics in the course.