Chapter 5
Spur Gear Design and Analysis ATAPS Package

ABSTRACT

The subject of spur gear design problem in mechanical engineering (ME) deserves significant attention since the subject relies heavily on the combination of complex mathematics formulas, graphs, and tables. Many students are facing difficulty in understanding the subject of spur gear design in Universiti Tenaga Nasional (UNITEN). Hence, a study was conducted to enhance the learning experience of UNITEN's ME students in the subject matter. In this research, the deterministic, divide, and conquer algorithms were employed to improve the problem-solving technique. The combination of these algorithms provided room for students to make assumption based on their input rather than having the computer to do all the calculation and as well as to break down the complicated problems into sub problems. Additionally, it was designed to examine the effectiveness of using computer-aided software to improve the learning experience and comparing it to the conventional approach.

INTRODUCTION

The data collection procedures involved using both methods of teaching, which is the Computer-Aided Learning (CAL) approach and conventional approach. Both groups of students were assessed based on their prior computer experience, preferred learning styles (as a result of Felder-Solomon's ILS questionnaire), learning experience and comparing the result in solving spur

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gear design problem with and without the CAL software. An analysis of the participants' results revealed that CAL software has helped ME students in solving spur gear design problem with a better approach. The first evaluation finds that more students from the group with Spur Gear Analysis Software were able to create a more cost and weight effective spur gear design problem as compared with the group without Spur Gear Analysis Software. The second evaluation finds that visual representation such as graph helps ME students in visualizing the concept and foreseeing the relationship between each parameter involved, making their learning experience easier and better.

The rapid growth of technology has made our life easier in one way or another such as the implementation of technology in education which is also known as Computer Aided Learning (CAL), Computer-Based Learning (CBL), and Computer Assisted Learning. The introduction of CAL has improved the conventional teaching and learning environment as CAL allows information or knowledge to be presented via multimedia such as image, text, audio and video (Sidhu et al., 2002). A study by Felder and Silverman (1988), has mentioned that the information presented in such way could cater for a diverse learning style, so students could benefit the most out of it. Hence, CAL is not something new and has also been implemented into many education fields which require more than just words to explain and present the theory or concept such as engineering education. In general, CAL has been used widely in the field of engineering as it involves heavily on the combination of mathematical formulas, free body diagrams and the effect of forces, where CAL is quoted by researchers as a solution to create a better problem-solving environment for engineering students. Hence, this work highlights recent work done in CAL and engineering education but specifically on Spur Gear Design in Mechanical Engineering. Additionally this work was also carried out to find research possibilities that could refine CAL to not only solve problem but also to improve the engineering student's learning experience (i.e. making assumptions/predictions).

BACKGROUND

Since the introduction of the Outcome Based Education (OBE) into the engineering programs by the Board of Engineers Malaysia (BEM), all engineering programs in Malaysia such as civil engineering, electrical and