COMPARATIVE STUDY OF DIFFERENT PROGRAMMING LEARNING TOOLS ON STUDENTS' MOTIVATIONAL AND ATTAINMENT LEVEL

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ABSTRACT

The development of Information and Communication Technology (ICT) has greatly influenced the way people live and work. The innovation in the field of ICT is also expected to propel the country towards the realization of Vision 2020. Application of ICT in learning is also gaining attention and popularity through implementation of various programs such as the introduction of Computer in Education program in schools which was later extended to the ICT Literacy (ICTL) program.

Among the highlights of ICTL program is to expose students to be familiar with computer environment and to enrich their learning experiences. One of the topics introduced in the schools is the basic programming. The programming topic is considered important as this is the key elements that need to be mastered by the students. Previous research revealed some factors that affected the learning of computer programming and one of the issues is the low level of students' motivation.

This study was conducted with the objectives to observe the effectiveness of various programming learning tools to enhance students' motivation and attainment level in learning programming in secondary school level. The effect of three learning tools; (1) MS Visual Basic, (2) Scratch and (3) PyGame on students' motivation and attainment levels were studied and analyzed. The ANOVA and *post hoc* analysis showed that there are significant differences existed between students' motivation and attainment level for each of the learning tools. The analysis was conducted on three different groups of students; (1) all students, (2) low-positive perfectionist students and (3) high-positive perfectionist students. Regression analysis was also carried out to determine which application features affect the students' level of motivation and attainment.

This study was expected to raise awareness among educators involved in the implementation of the ICTL program in schools in identifying the students' perfectionism trait. The findings provide a deeper understanding in aiding the educators to estimate and evaluate students' motivation and attainment level in learning programming. This helps educators to select appropriate learning tools that can increase the students' interest

toward learning programming and thus increase their motivation and attainment in learning computer programming.

ABSTRAK

Perkembangan Teknologi Maklumat dan Komunikasi (TMK) telah banyak mempengaruhi cara manusia hidup dan bekerja. Hasil inovasi dalam bidang TMK juga dijangka akan dapat memacu negara kearah merealisasikan Wawasan 2020. Penerapan TMK dalam pembelajaran di sekolah-sekolah juga semakin mendapat perhatian dan menjadi pilihan pendidik menerusi pelaksanaan pelbagai program seperti pelaksanaan program Komputer Dalam Pendidikan yang kemudiannya dikembangkan kepada program Literasi TMK.

Antara tumpuan dalam program Literasi TMK ini adalah untuk mendedahkan pelajar dengan persekitaran komputer dan mengukuhkan pengalaman pembelajaran mereka. Salah satu daripada topik yang diajar adalah melibatkan asas pengaturcaraan. Topik pengaturcaraan ini adalah penting memandangkan elemen ini adalah merupakan elemen utama yang perlu dikuasai pelajar sebelum boleh menguasai bidang perkomputeran. Kajian terdahulu telah mendedahkan beberapa faktor yang mempengaruhi pembelajaran pengaturcaraan komputer dan salah satu isu yang terlibat adalah tahap motivasi pelajar terhadap pembelajaran yang rendah.

Kajian ini dijalankan dengan objektif untuk melihat keberkesanan penggunaan alatan pembelajaran yang pelbagai dalam usaha meningkatkan tahap motivasi dan pencapaian pelajar dalam pembelajaran pengaturcaraan di peringkat sekolah menengah. Kesan tiga alatan pembelajaran; (1) MS Visual Basic, (2) Scratch dan (3) PyGame ke atas tahap motivasi dan pencapaian pelajar dikaji dan dinanalisa. Analisis ANOVA dan *post hoc* menunjukkan terdapat perbezaan yang signifikan antara tahap motivasi dan pencapaian pelajar bagi setiap alatan pembelajaran. Analisis yang dijalankan melibatkan tiga kumpulan pelajar yang berbeza; (1) keseluruhan pelajar, (2) pelajar dengan kesempurnaan-positif rendah dan (3) pelajar dengan kesempurnaan-positif tinggi. Analsisi regresi turut dijalankan bagi menentukan ciri alatan yang memberi kesan kepada tahap motivasi dan pencapaian pelajar.

Kajian ini dijangka akan dapat meningkatkan kesedaran di kalangan pendidik yang terlibat dalam pelaksanaan program Literasi TMK di sekolah akan keperluan untuk

mengenalpasti ciri kesempurnaan pelajar. Dapatan kajian menyediakan panduan dalam membantu pendidik untuk menganggar dan menilai tahap motivasi dan pencapaian pelajar dalam pembelajaran pengaturcaraan. Ini dapat membantu pendidik dalam memilih alatan pembelajaran yang sesuai yang dapat meningkatkan minat pelajar kepada pembelajaran pengaturcaraan seterusnya meningkatkan tahap motivasi dan pencapaian pelajar dalam pembelajaran pengaturcaraan.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1

INTRODUCTION

1.1 Introduction

In 1996, former Prime Minister of Malaysia, Tun Dr Mahathir bin Mohamad launched the Multimedia Super Corridor, also known as the MSC, one of the government's efforts to bring Malaysia in line with the rapid development of Information and Communication Technology (ICT). No one can deny the importance of ICT as a catalyst in accelerating the growth of our country's economy and Tun Dr Mahathir's initiative also is considered as one of the major efforts to forward the country to the Vision 2020.

What is the significance of the MSC launch to all Malaysians? Among the benefits derived from this effort is the admission of giant corporations, who would then bring new technology into the country. The leading companies operating in Cyberjaya, are considered as the heart of the MSC including Dell, Intel, Oracle and several other giant companies which have been given the MSC status. But the question arises whether we can cope with the advancement of the technology or we are to remain only as a technology user.

The Department of Statistics released figures in the third quarter of 2011 showed that only 1.7% of employment involved in the sector of ICT. It amounted to 204,300 out of 12,259,200 people of working Malaysians (The Department of Statistics, 2011). Comparing this figure to the high market demand for employment in this sector, it is clear that a concerted action should be established to encourage Malaysians, particularly the students to make these areas as one of their choices when pursuing studies at the higher level. Efforts taken include introducing ICT as a lesson in school starting from the implementation of Computer in Education program since 1992 which was later replaced

by the Information and Communication Technology Literacy (ICTL) program since 2002. However, this approach did not seem to fully improve the situation as the students are still facing difficulty in learning programming at the university level. Hence, it is important to study the factors affecting students' mastery of programming.

One of the factors that may affect the students' learning experience is the *motivation*. Cherry (2012) define the motivation as a process that can initiate, guide and maintain goal-oriented behaviors. She categorized motivation into extrinsic and intrinsic motivation in which the extrinsic is associated with the motivation that arise from the external factors such as the recognition and rewards while intrinsic motivation normally arise from within an individual. The approach on how to increase the motivation of the students were discussed extensively by many parties especially those in the education community. The educators will always look into the possibilities of applying various learning approaches so that they can provide better lesson and thus increase the students' motivation in learning the subject matter. Previous research proved that there is relation between the motivation and the students' learning experience. Takemura et al. (2007) analyzed the relationship between learning materials together with the students' motivation in learning programming. They verified from their analysis that there is a clear relation between students' motivation to the learning process as the desire of the students affects their motivation in learning programming.

The availability of various programming learning tools has benefited the education community in term of providing a list of learning tools for the educators to choose from. These applications normally were developed with different approach such as Project-Based Learning (PBL) and Game-Based Learning (GBL). The orientation of this application basically can be discovered from the availability of the features equipped with the applications. These features are known to have effects in students' learning styles and they can also influence their motivation towards the learning such applications. In fact, this has explained the observed recent trend in innovative learning styles such as PBL and GBL applied in a classroom environment. This research will look into the effectiveness of using three different programming learning tools which is the

conventional application, PBL application and lastly the GBL application. The students' experience in using the mentioned applications were recorded and analyzed.

The background of the students especially their psychological characteristics also play a significant role in influencing their learning style. One of the psychological characteristics that is worth to explore related to the perfectionism trait. Some researchers conducted a study to see how perfectionisms can affect the students' motivation and attainment level. Ram (2005) investigated the relationship between the positive and negative perfectionisms to the students' academic achievement and motivation. She found that there was a strong association between positive perfectionism with higher academic achievement and motivation. In contrast, no evidence was found between negative perfectionism and academic achievement and motivation but instead it was associated with negative personality factors. This finding explained why some students who have potential to succeed and yet have difficulties to excel in their studies. More studies should be carried out by the educators to better understand their students' learning behaviors so that a suitable approach can be taken.

Despite the clear relation between perfectionism trait and students' learning experiences, there was few studies being done in the context of computer programming education. Research as such is needed in order to fulfill Malaysia' vision to integrate ICT as a tool to accelerate the development of the country. This study is timely and valuable to fill up this gap. In this research study, two different groups of students learning programming using three types of different learning tools were studied. The students were categorized according to their psychological characteristics, specifically according to their degree of perfectionisms. The study first determined the difference between the low-positive perfectionist students and high-positive perfectionist students. Their response towards the three different programming learning applications were analyzed. The relationships between students' degree of perfectionism and their levels of motivation and attainment were observed.

1.2 Research Background

Computing can actually be learned and taught without involvement of programming. However, in striving towards being a nation of technology producers rather than merely technology users, programming is recognized to be an important element in any school computing curriculum. Programming may be defined as a set of instructions that direct the computer to perform a task which required the processing of data to become useful information. Three key elements involved in this process are the input, process and output. The human factor plays an important part in providing the input to the systems so that it can produce the desired output. What makes programming considered as difficult? Part of the problem identified is that programming requires problem solving skills and high accuracy, but this does not fully explain the problem. To complete a programming problem, a person need to interpret their solution into a form that is understood by a computer, but always a person found it is difficult to do so. This is a user-interface problem that has long been recognized but neglected (Pane, 2002).

In Malaysia, the efforts to inculcate computing mastery have been reviewed from time to time and recently we have the implementation of Information and Communication Technology Literacy (ICTL) program. In secondary schools, the Just Basic and Microsoft Visual Basic Express application are widely used and these are the software deployed by the Ministry of Education as learning tools to expose the students to computer programming environment. The issue that may be debated here is whether the software can actually be fully manipulated and further optimized to motivate the students to learn computer programming. Another issue that we need to address is how far the application can cater for varied groups of students with different psychological characteristics. Undeniably, such application as Microsoft Visual Basic Express is a powerful software to produce a particular computer program. Considering the secondary school level, it is much more appropriate if the terminology of the programming being disclosed first to the student rather than attempting to make the student produce computer programs without mastering the foundation. Other preferred alternative is by using the appropriate software including the use of freely available open source visually-oriented programming tools. The main focus of such application will be a pedagogical aspect of

programming while the interesting interface has made them as one of the best competitors that could compete with the existing conventional software. In addition, the current situation which sees the school administration having a limited budget, the use of open source software is the suitable approach that can be considered as it was cost effective. Young people generally prefer an interactive learning environment. Having the appropriate tools equipped with useful features can enhance their experience in learning computer programming. Animation and gaming can be manipulated to provide an interesting programming environment to the students.

Now what we have to do is to focus on the development of our students while preparing them with the appropriate exposure before they pursue their study at the higher level. Good foundational skill together with intellectual curiosity will give them a good start in becoming knowledge workers, or good software engineers in case they chose to enter ICT field.

1.3 Problem Statement

Several studies (Huang et al., 2004; Mahmud et al., 2009; Che, 2012) have been done aiming to determine how to increase the motivation of students and their attainment in learning programming applications. Various programming learning applications have been developed and introduced to cater for several situations and issues. Kelleher (2006) in her research looked into the effect of alternative software which she developed to study on the learning motivation of a group of female students. Having two different versions of software which she names as Storytelling Alice equipped with storytelling features and generic Alice which don't have any storytelling features. She found that students who are using Storytelling Alice demonstrated stonger engagement with the programming as compared to the students who used the generic Alice (Kelleher, 2006). This findings highlighted the significant differences in the students' experience when they are using an alternative application that comes with an additional and interesting feature.

There is also a possibility to manipulate computer games as a learning tool to be use in learning programming. A research conducted by Cliburn (2006) in which the

students are given five introductory programming course assignments with the option a game and non-game projects. From this research he found out that the games can give enjoyment and thus increase the students' motivation even though it's may not improve the students' grading score.

There is always a challenge in developing any learning tools considering that it can cater to the various needs by the various backgrounds of users. It seems there is not much research has been conducted to study the interaction between the students' psychological background especially the perfectionisms traits to their experience while learning programming. Thus, this research examined the effects of different programming learning tools on the students' motivational and attainment level especially considering two different groups of students with different perfectionisms trait. The interaction effects between the positive perfectionisms (the low-positive perfectionist and high-positive perfectionist) and their motivational and attainment levels were tested. Finally, this study has identified the effects of the programming applications features on the students' levels of motivation and attainment.

1.4 Research Objectives

Three main objectives in this research study are:

1. To study the effect of different programming learning tools on students' level of motivation and attainment.

2. To examine the relation between adaptive perfectionisms (positive perfectionisms) and the students' levels of motivation and attainment in learning computer programming in schools.

3. To analyze the effects of application features to the students' level of motivation and attainment.

1.5 Research Questions

The research questions are as follows:

1. What are the effect of different programming learning tools on the students' motivational and attainment levels?

2. What is the best application that can be use to teach programming in schools, based on the level of students' perfectionisms?

3. What are the application features that affecting the students' levels of motivation and attainment?

1.6 Research Hypotheses

The hypotheses of this study are related to the research question as stated above and being defined in several situations as follows:

H_1: There is a significant difference in the motivational scores between the VB, Scratch and PyGame application for all students

H_2: There is a significant difference in the attainment scores between the VB, Scratch and PyGame application for all students

H_3: There is a significant difference in the motivational scores between the VB, Scratch and PyGame application for the low-positive perfectionist students

H_4: There is a significant difference in the attainment scores between the VB, Scratch and PyGame application for the low-positive perfectionist students

H_5: There is a significant difference in the motivational scores between the VB, Scratch and PyGame application for the high-positive perfectionist students

H_6: There is a significant difference in the attainment scores between the VB, Scratch and PyGame application for the high-positive perfectionist students

1.7 Significance of the Study

In Malaysia, study related to the issues affecting the learning of programming may still not widespread, but internationally, this topic has become an important issue and has been studied before. Most of the previous research seeks to mitigate the difficulties of learning programming by providing an alternative method of learning. In this study, the research focus on how to improve the students' motivation by using PBL and GBL applications and also seek to study the effect of perfectionism trait to the students' learning experience. This study is expected to create awareness amongst the educators on the importance of identifying the students' psychological background and their relation to the students' motivation and attainment level and thus provide a guideline for the selection of learning application that fit students' psychological background.

The current situation at the school level does not encourage the teachers to use various learning applications to fit the students' psychological background. Indeed, undoubtedly there are many more possible categorizations of students, but this study will only focused on positive perfectionisms trait which has been proven to affect the motivational and attainment level of the students.

The programming learning tools used in the schools were tested in term of their effectiveness in meeting the needs of students with different psychological characteristics. Observation was conducted to study the relation of the application used to the students' motivation and attainment level for both low-positive and high-positive perfectionist students. Aside from VB, the application currently in use in schools in Malaysia, the study encompasses the alternative applications namely the *Scratch and the 2D-Programmable PyGame Based Computer Game.* For a comparison purpose, the effectiveness of the applications in improving student motivation and attainment in learning programming especially in the two groups of students was studied and recorded.

1.8 The Research Framework

The research framework used in this study is illustrated in the figure 1.1. The independent variables are levels of perfectionism and programming learning tools; Visual Basic, Scratch and 2D-Programmable PyGame Based Computer Game while dependent variables are the levels of students' motivation and attainment.

In this study, the alternative learning applications are expected to increase the motivation and attainment levels of the students towards the programming learning. Previous study (Kelleher, 2006; Baharudin, Jamaludin and Wan Yahaya, 2011; Wu and Fan, 2010; Rajala et al., 2008; Bierre et al., 2004) showed the effectiveness of multimedia based medium tools on the learning process and students' motivation. This study also looked into how the psychological characteristics of low-positive perfectionist and high-positive perfectionist students relate to the students' motivation and attainment level while learning computer programming using several different learning applications. To further explain this situation, the application features that affect the learning were analyzed.

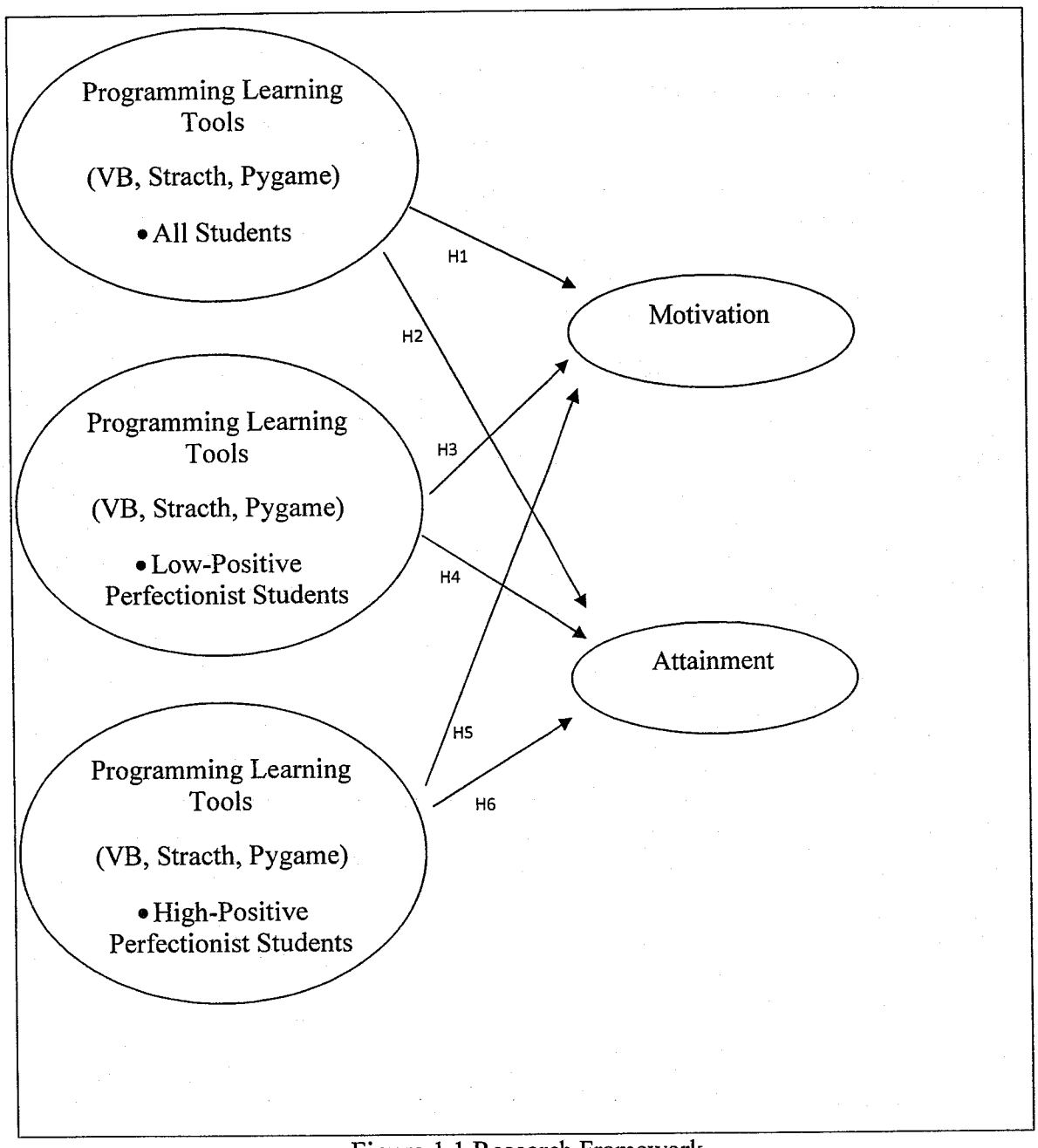

Figure 1.1 Research Framework

1.9 Operational Definitions

The following is an explanation of the terms used in this study which may help to understand this study:

Conventional Learning Tool

Refer to the Microsoft Visual Basic Express application. This application supplied by the Ministry of Education as a tool to be used in learning programming in school under the Information and Communication Technology Literacy (ICTL) program.

Project-Based Learning Tool

This term refers to the Scratch application. Students can create a programming project by using the available programming code in the application.

Game-Based Learning Application

Refer to the 2D-Programmable PyGame Based Computer Game application. This application applied the concept of games in education by providing an interactive learning environment. Students learn on how to use a correct coding in order to accomplish the mission.

Low-Positive Perfectionist Student

Student who obtain score below the group median score for the Personal Standard and Organization subscale of the Frost Multidimensional Perfectionism Scale (FMPS) questionnaire.

High-Positive Perfectionist Students

Student who obtain score above the group median score for the Personal Standard and Organization subscale of the Frost Multidimensional Perfectionism Scale (FMPS) questionnaire.

Motivational Level

Scores are obtained by the students from the Instructional Materials Motivational Scale (IMMS) questionnaire for each of the learning applications. The IMMS was adapted from the Keller (2000).

Attainment Level

Scores achieved by the students for two respective tests, programming logic pre-test and post-test. The differences between the pre-test and post-test score were calculated for each of the students in each workshop session for three different learning tools; Visual Basic, Scratch and 2D-Programmable PyGame Based Computer Game.

Application Features

A set of questionnaire modified from the General Interface Usability Criteria (Bekim Fetaji et al., 2011) consisted of System Visibility (SV), User Control (UC), System Flexibility and Efficiency (SFE), System Reliability (SR) and System Interface (SI) subscales.

Form-Two Students

Students aged between 12 and 13 years old in the education system of Malaysia. Programming is one of the subtopic that the students learn under the Information and Communication Technology Literacy (ICTL) program.

1.10 Conclusion

The study was conducted with the objective to see the differences in the relation for three different programming learning tools to the students' learning experience. The study covered all students and the students with different perfectionisms trait that is the low-positive and high-positive perfectionist students and their experiences while learning programming. Two main variables were observed and recorded which is the students' motivation and attainment level. The significance differences for all students and both groups of students in terms of motivational and attainment level for each of the learning tools were analyzed. Information obtained is expected to provide an input to the educators in schools specifically the teachers in the use of appropriate learning tool for the teaching of computer programming.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Students mostly found that it is uninteresting to learn programming. This may be due to several factors that have been identified and one of them is related to the students' own motivation. Normally the motivation of the students is usually influenced by their initial perceptions towards the learning beside their experiences during the learning process itself. Thus the very important step that we need to consider is the provision of a suitable learning environment with the use of a reliable tool to increase students' motivation towards the learning. This chapter will review previous research related to the students' learning process and how their motivation and attainment can be improved. Also provided is the review related to psychological characteristics of the students that are supposedly able to influence the students' learning experience which is the students' perfectionism trait. The overview of the variables involved in this study also included.

2.2 Learning Programming and the Factors Influenced

Computer programming should be understandable and accessible to all, particularly to children and youth of secondary school age, who are generally quite responsive to computer technology. Teachers should facilitate opportunities to develop interest among students who are motivated to learn by capitalizing on inherent levels of curiosity and a willingness to try new things. In Malaysia, several approaches had been taken and one of them is the implementation of Information and Communication Technology Literacy (ICTL) program in primary schools since April 2005 and in secondary schools since March 2002, later extended to most schools in 2007. The implementation of this program

aimed to expose students to the use of the computer and learning within ICT environment. The topic that was taught in this program is the use of office applications such as word processing software, spreadsheet software and presentation software. Programming foundations were included as well (Pusat Perkembangan Kurikulum, 2007). Issues have arisen as to the extent to which children involved in this initiative have been successful in familiarizing themselves with programming applications.

2.2.1 Motivation

Some studies emphasize the relation of motivation in learning. Lim and Kim (2002) conducted a study to see the relation between motivations to the online learning course. Their finding shows that almost all the motivation variables did make affect to the students' learning experience. Tella (2007) also makes similar findings as he study the impact of motivation on the students' academic achievement. The findings justify the importance of motivation on students' achievement and he suggested that all parties involved including parent, schools and the government to engage more activities and program that can enhance the students' motivation and thus improve their academic achievement. Another study by Lee (2010) to the group of college students in Taiwan shows that beside the total teaching quality and peer-assisted learning, motivation factors also play a role by having positive significance effect on students' achievement. He provides a suggestion on how the schools can improve the motivation by several approaches like establishing a better competitive environment and awarding students with an outstanding result a scholarship. Ushida (2005) highlighted the importance of motivation in the students' learning process. As the study were conducted on the students learning second language using online language courses, there is an evidence that the students with higher motivation will study regularly and will take any opportunity productively to perfect their language skills. Choosri and Intharaksa (2011) conducted a study on the students' motivation to the learning achievement. They conclude that motivation has a positive relationship to the students' achievement. They also suggested an explanation as the finding were resulted from the fact that students having great interest on the learning which increase the motivation and affect their achievement.

Narayanan et al. (2008) discovered the factors that affect the students' learning. Together with the attitude and gender factors, students' motivation gives a great impact to the learning process and affects the learning outcome. Shih and Gamon (2001) analyzed the relationship between students' achievement to several variables including the attitude, learning styles, demographic locations and most importantly the motivation on the students who engaged in web-based learning. The only significant factor that they discovered to affect web-based learning is the motivation which accounted for more than one fourth of students' achievement. The findings supported the importance of motivation in enhancing students learning experience.

2.2.2 Learning Tools

Cetinkaya and Oruc (2011) listed out the possibility of physical learning environment effect on students' motivation level. Their research findings revealed that well equipped classroom together with better physical condition can enhance students' motivational level. Huang et. al (2008) looks into the effect of Online Office Instruction on motivation in elementary school students. Based on their research, they concluded that Online Office Instruction has significantly improved the students' motivation and having an effect to the overall learning. We also can consider using an open source learning application as the learning tools. Aydin and Tirkes (2010) investigated the potential of open source Learning Management Systems (LMS) to improve the educational quality. Several open source LMS was tested and the results show that open source LMSs can improve the quality of educational pedagogy as they have most of the tools that the e-learning system should have. Integrate a virtual reality application into the learning is also an option. Chung (2011) explores the relation of virtual reality tools to the learning curriculum considering their effect to the students' motivation and learning achievement. In terms of academic achievement, the researcher found that the students who engage with the virtual reality tools outperformed their friends who only received conventional lectures. Besides that, in term of motivation the application seems attracted the students' attention thus leading to the higher willingness in the engagement of the class. Another option that is available is by using a mobile based learning environment. Tan and Liu (2004) developed

a mobile-based learning environment application and study their effectiveness on elementary school students' learning. They conducted an experimental test and the result shows that there is an increasing interest on the students and this indicates that the learning effect using mobile-based application is better than the traditional learning approach. Liu et. al (2007) integrates 2D barcode and augmented reality application to support a learning. They evaluate the effects of the proposed learning application and also the students' learning attitudes. From their research there is an indication that the developed application can give benefits to the students' learning experience.

2.2.3 Perfectionisms Trait

Another focus of this research is to study the factor of students' perfectionism trait on students learning experience. Ram (2005) studied the relationship of positive and negative perfectionism to academic achievement, achievement motivation, and well-being in tertiary students. The researcher hypothesized that positive perfectionisms is related to higher academic achievement and motivation while negative perfectionisms is related to lower level of academic achievement and motivation. In her research, she found out that positive perfectionism is associated with higher motivation and academic achievement. Specifically, psychologists have distinguished two types of perfectionism; adaptive (what we call positive perfectionism) and maladaptive perfectionism. The distinction between the two is important because adaptive perfectionism is associated with achievement and success, while maladaptive perfectionism is related negatively to mental health.

Stoeber and Otto (2006) studied the positive conception of perfectionism. They suggested that striving for better and perfect result is associated with positive characteristics and adaptive outcomes. Stoeber and Rambow (2007) then investigated the statement to a group of adolescent students and the findings showed that striving for perfection in adolescent school students is associated with positive characteristics and adaptive outcomes and thus may form part of a healthy pursuit of excellence. Another study by Stoeber and Kersting (2006) looked into the possibility if the perfectionist

strivings also predict the aptitude test performance, while controlling for conscientious achievement striving. The participants were given a set of aptitude test comprising reasoning, speed and work sample test. They found out that while conscientious achievement was unrelated to performance in all tests, perfectionist strivings predicted higher performance in both reasoning test and work sample test.

Yao (2009) explored the relationship between perfectionisms to the academic achievements of Asian American students. The finding showed that adaptive perfectionists reported less frequent procrastination and greater confidence in their abilities to master academic tasks. In contrast, maladaptive perfectionists indicated that they had less confidence in their abilities to successfully perform academic tasks and were more likely to delay initiation or completion of such tasks. Previous research has implied the dimension of perfectionisms. Kim (2010) studied the differences in the perceptions of perfectionism as adaptive or maladaptive. The results indicated that the two subscales have different associations with core personality dimensions and positive and negative psychological outcomes. This research therefore supports the value of the measurement of perfectionism that examines the perceptions of perfectionism as both adaptive and maladaptive. Bousman (2007) also suggested two distinct types of perfectionism, maladaptive and adaptive perfectionism. In her research, maladaptive and adaptive perfectionism were used to determine that traditional perfectionism measures can be used with a working adult sample to achieve similar psychometric properties, and to preliminary test hypotheses related to their relationship with other individual difference variables. This study focused on the adaptive (positive trait) of perfectionisms as there is an evidence of clear relationship between the said trait to the students' academic achievement.

2.3 Programming Learning Tools

There are three different programming learning tools used in this research. The three different learning tools have different learning approach in which the VB is considered as conventional software while the Scratch is Project-Based Learning (PBL) software and

the PyGame represented the Game-Based Learning (GBL) software. According to Oxford Advanced Learner's Dictionary, conventional can be define as following what is traditional or the way something has been done for a long time. VB is the software that has been used in the school to teach programming in the ICTL program since the early implementation back in the 2007. Wan et. al (2010) highlighted the problem with the VB teaching as there is a need that the teaching being conducted in a sequence from the introduction of the concept to the debugging of the program. Most of the students found it is difficult to understand the concept and this eventually affect their enthusiasm to learn. Zili and Yue (2012) propose some reforms to the VB teaching as they want to improve the low effectiveness of the teaching caused by traditional teaching method. Using the project-driven teaching method, they found an impressive result as the interest of the students towards the learning is increase. Biao (2010) also suggest a reform to the traditional VB teaching method. Proposed the reform to be based on group teaching method, he found that the students' enthusiasm learning programming can be increase through this practice. Beside that the student programming project completion is also improved. Considering the interest towards the reform to the VB learning method, it is maybe the time for the educators to consider alternative software such as PBL and GBL application as their teaching tool to aid their teaching.

Another tool used in this study is the Scratch. This software was developed by the Lifelong Kindergarten Group at the MIT Media Lab, with financial support from several institutions and organization (MIT Media Lab, 2012). The focus of this software is to encourage the young people to create and share their Scratch project while learn mathematical and computational ideas. This programming learning tool applied the concept of PBL. Wu and Fan (2010) listed out several characteristics of the PBL application. The first and the essential characteristics of PBL is the learning process should be the one that is student centered. Having the teachers as a facilitator, the learning normally occurred in a small group of students. The problems are being manipulated to organize focus and also as a stimulus in the learning process. This will ensure that new knowledge can be acquired through the self directed learning. Guarasa et al. (2006) conducted a study on the effectiveness of PBL strategy to increase the attractiveness of the curriculum of electronics systems. The findings showed that there is

an increment in the students' interest towards the subject and at the same time also increases the students' average grade. Anquan et al. (2010) implemented the PBL to the teaching of object-oriented programming course. They found an evidence of an increase of students learning initiative together with the increment in their programming skills and independence innovation. Several researches applied the PBL approach to their proposed applications to be use as a learning tool. Rajala et al. (2008) used the ViLLE Tool to study the effectiveness of program visualization to aid novices with their difficulties in learning to program. Another study done by Bierre et al. (2004) looked into the use of MUPPETS in an introductory Java programming course. The MUPPETS system was designed to allow students to develop visible 3D objects in Java within a game-world environment with minimal knowledge of graphics programming.

The third and the last tool used in this study is a 2D-Programmable PyGame Based Computer Game. Baharudin and Jamaludin (2011) describe the PyGame as a novel GBL courseware which being designed to teach computer programming to school children. The children can learn the basic ideas of programming, which govern variables, assignments, looping constructs and if-else statements. The researchers believe that this game encourages the students to develop and practice their logic and analytical thinking while build their problem solving skill. Although this instrument is still in prototype stage and not a matured product like Scratch which had been developed over years, it is interesting to study the effect of this courseware to the students experience in learning programming and how this courseware correlate with the students motivational level since there is evidence that the GBL can increase the motivation of the students in the learning process and also affect their academic achievement. Ibrahim et al. (2011) studied the students' perceptions on using educational games as a medium to learn computer programming. There are five construct that being tested including the motivation, attitudes, cognitive development, interface and expectation. Their findings indicated that most students were highly motivated and generally have a positive attitude to learn programming by using a game compared to conventional methods. Blunt (2007) conducted a study to see whether there is any differences in academic achievement among students who did and did not use computer games in learning. Using three different video games, he found out that the students who use the games in learning

scored higher than their friends who did not use the games. Vankus (2008) studied the effectiveness of game based learning in teaching mathematics in lower secondary school. Using the didactical games, the focus is to study how the games influence the students' mathematical knowledge and their attitudes towards the subjects. Results show that the students who use the didactical games registered an increase in their attitudes towards mathematical although the knowledge is statistically equal for both groups. Kuo (2007) also reported the engagement of the GBL environment to the students' motivation. The comparison results from the pre-test and post-test showed that there is improvement in their interest in learning the subject in the GBL environment rather than non GBL environment. Another research by Lin and Wei (2011) also highlighted the relation between game based learning and motivation. Using Interactive Game-Based Learning System (IGLS) as their main research tools, they found evidence that the mentioned tools can enhance the students' motivation an academic performance. The results from the sample t-test showed an impact to experimental group to significance .05.

2.4 Programming Learning Tools and Students' Motivational and Attainment Level

Two measurement procedures were conducted to assess the students' attainment score in each workshop that the students participated for each of the programming learning tools that were used. Pre-test and post-test programming language quiz were provided to the students and the differences between the two tests were calculated. The students' attainment score normally will reflect their understanding towards the lessons. From the score one can assess the students' level of understanding. Grgec et. al (2010) compare the students' score with their initial score in introduction to programming course. Several procedures have been carried out including the use of questionnaire, assignment and written tests. Wang et al. (2009) conducted an experiment to study the effectiveness of Alice program to the high school students in learning programming concepts. Students' scores were analyzed to see the differences between the groups of students who use Alice as their learning tools compared to the other group who did not use it.

The Instructional Material Motivational Survey (IMMS) questionnaire by Keller was used to determine the student's motivational level towards the programming learning tools that they used. IMMS questionnaire is widely used by most researchers as their study instrument to assess their subjects' motivational level. Huang et al. (2004) uses the IMMS to measure the students' motivational level in evaluating a computer-based tutorial for the purpose of proposing effective instructional interventions. Mahmud et al. (2009) conducted a study on the CAI courseware on the students' achievements and motivation in learning mathematics. The researchers use three different instruments including the IMMS questionnaire to gather the data. Another study by Che (2012) also used the IMMS as the study instrument to assess the subjects' motivational level while evaluating the video on demand learning approach to a group of students. The collected data were then being analyzed so that better understanding and conclusion can be made.

2.5 Conclusion

This chapter describes the factors affected students' learning experience and the variables involved in this research. Their relation to the students' learning experience was discussed based on the previous research by other researchers. There are three mainly factors which are the motivation, the learning tools and the perfectionisms.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

Previous chapter highlighted the review on the relevant literature regarding the factors that affect the learning of programming in schools and the review on the variables used in this research. This chapter discusses the research methodology followed by research design, research sample and sampling, research instrument, research procedure and analysis.

3.2 Research Design

The study aimed to see if the psychological characteristics of low-positive perfectionist and high-positive perfectionist students relate to the students' motivation and attainment level while learning computer programming using several different learning applications (see Figure 3.1).

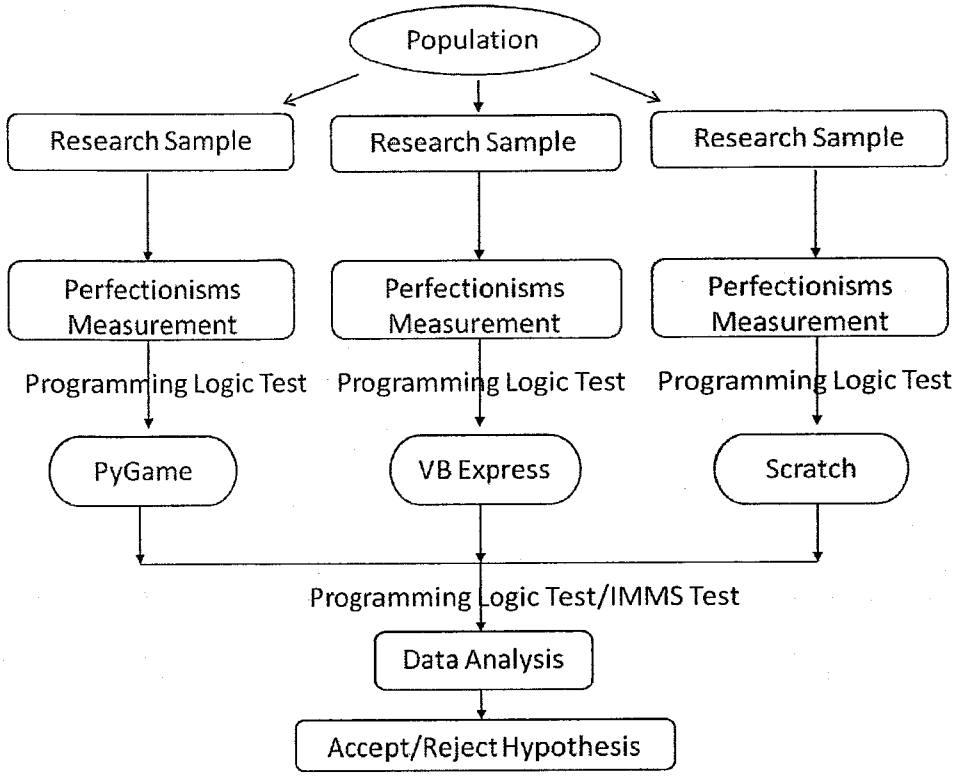

Figure 3.1 Research Flowchart

The research design chosen was an experimental with 3x2 factorial design measuring students' motivation and attainment in learning computer programming with three different learning tools. Frankael and Wallen (2009) explained that the experimental method is the best way to establish cause-and-effect relationships among variables. The independent variables were the instrument used (Visual Basic, Scratch, PyGame) and positive perfectionism (low-positive perfectionist, high-positive perfectionist). For the dependent variables, two values will take effect which is the motivational and the attainment level. The interaction between the variables was illustrated as in table 3.1.

Learning Tools	Degree of Perfectionisms	
	Low-Positive Perfectionist (X_1)	High-Positive Perfectionist (X_2)
Visual Basic (Y_1)		
Scratch (Y_2)		
PyGame (Y_3)		

Table 3.1: Research Design Diagram (Illustration of Interaction)

In the later stage of the study, the effects of application features on the students' motivation and attainment level were identified. The features were measured in 5 different subscales namely the System Visibility (SV), User Control (UC), System Flexibility and Efficiency (SFE), System Reliability (SR) and System Interface (SI).

3.3 The Research Sample and Sampling

The selection of respondents was carried out by applying the stratified sampling method. The sample chosen comprises of 591 form two students aged between 14 and 15. These students are currently studying in a Malaysian national school located in Ipoh, Perak. As of January 2012, the schools Form Two students' composition comprises of 174 Malays (65.9%), 62 Chinese (23.5%) and 28 Indians (10.6%). The students were selected in a two year period.

3.4 Research Instrument

There are three instruments used in this research. To identify the psychological characteristics of the students, FMPS questionnaire was used. Secondly, General Interface Usability Criteria (GIUC) questionnaire was used to identify which features that

effect the students' motivational and attainment level. Finally the IMMS questionnaire was applied to assess the level of the students' motivation towards the learning.

3.5 Research Procedures

For the first stage of the study, perfectionism was measured to identify and categorize the respondents into two distinct groups, namely the low-positive perfectionist and high-positive perfectionist. The Frost Multidimensional Perfectionism Scale (FMPS) was used to identify this group of students so that they can be separated according to levels of perfectionism. Stober (1998) defined the FMPS as six subscales questionnaire for a multidimensional assessment of perfectionism: Concern over Mistake (CM), Personal Standards (PS), Parental Expectation (PE), Parental Criticisms (PC), Doubt over Action (D) and Organization (O). A study by Frost et al. (1993) found that the personal standards and organization subscales combined to form a factor that reflect the more positive aspects of perfectionism (adaptive). The concern over mistakes, parental criticism, parental expectations and doubts about actions subscales clustered to form a factor reflecting the more negative aspects of perfectionism (maladaptive). In this study, the score for personal standard and organization subscales were calculated to determine the students' positive perfectionisms level. The median score for positive perfectionist subscale is set as the threshold to separate the students to the low-positive and high-positive perfectionist.

Students were then introduced to basic programming language before being tested with a short programming logic quiz as a pre-test and after that they attended a workshop on how to use Visual Basic Express (VB) application. The students were required to modify the code according to the guidelines provided. Modification of the code affected the interface and function of the program created. See figure 3.2.

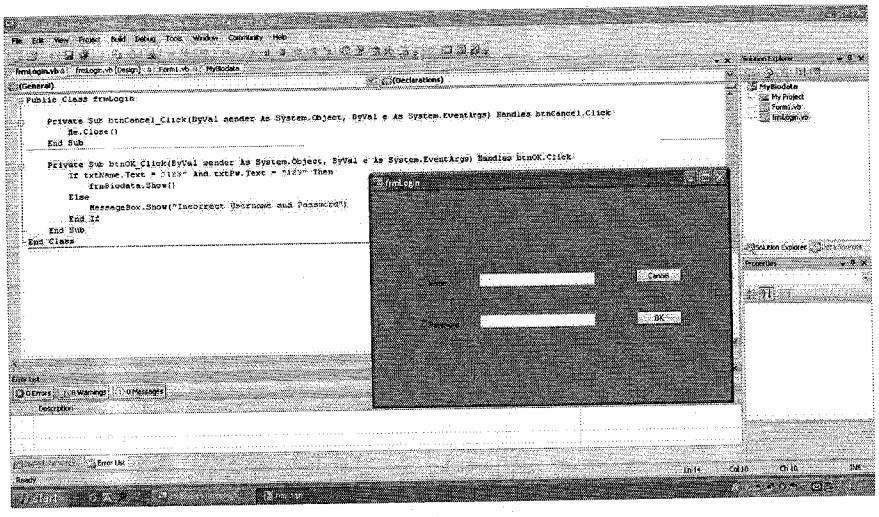

Figure 3.2: Students' Project Using MS Visual Basic

At the end of the session, a programming logic quiz as a post-test was conducted again to test the students' understanding on VB code. The difference between the post-test score and pre-test score were calculated and the values were recorded as an attainment score. The (Instructional Material Motivational Survey) IMMS questionnaire was used to examine their level of motivation towards the application used.

The same procedure was conducted in two different sessions for the Scratch and the PyGame. For Scratch, the students were required to develop a project by choosing and arranging the appropriate code that available in the application. See figure 3.3.

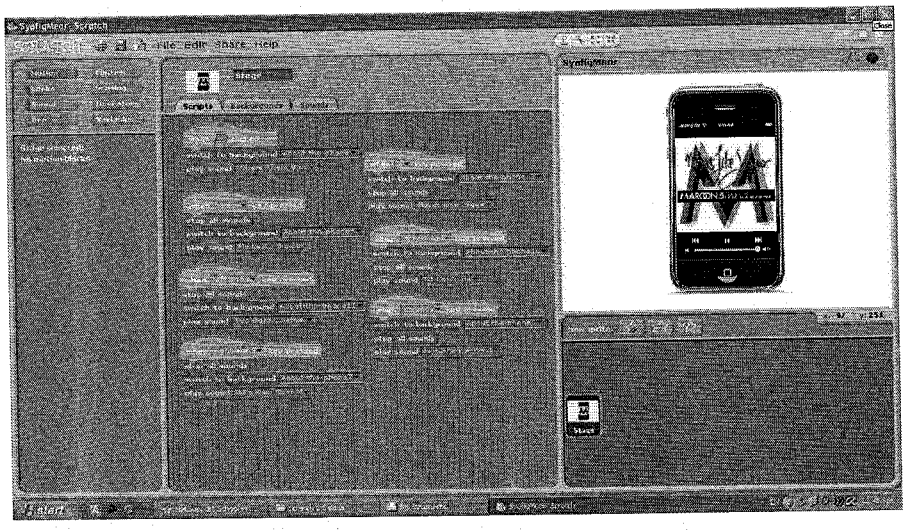

Figure 3.3: Students' Project Using Scratch Application

The last instrument used is the PyGame. In this GBL application, students were required to complete the game based on the mission provided on screen. In this workshop, the students need to arrange code accordingly before they were given access to proceed to the next level. See figure 3.4.

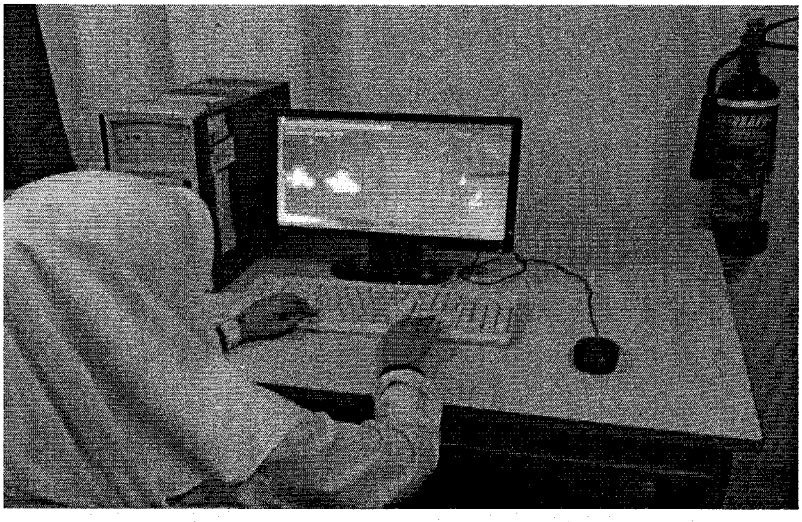

Figure 3.4: Students Use PyGame to Learn Programming

3.7 Data Analysis

Data was analyzed using Statistical Package for the Social Sciences application (SPSS version 14). Reliability test was first conducted to test the reliability of the instrument used in this research. ANOVA was then being run on the data collected to examine the differences that may exist between the different programming learning application for each of the domain that is the students' motivational and attainment level. Post hoc test was also being run to discover the interaction between each of the mean involved. Finally the regression analysis procedure was carried out to determine to the extend which the features of the application affect the students' level of motivation and attainment.

3.8 Conclusion

Firstly this chapter looks into the research design applied in this research. Secondly the discussion on the research sample and sampling and research instrument were provided and followed by research procedures and data analysis procedure.

CHAPTER 4

RESULTS

4.1 Introduction

This chapter discussed the findings of the research. First, the results of reliability test are presented which then followed by the respondent demographic profiles. In this study, the analysis procedures were conducted in two stages to address the following research objectives: (1) ANOVA and post hoc test to examine the relationship between programming learning tools (VB, Scratch, PyGame) and the motivational as well as the attainment level of the students, (2) Regression analysis to predict the application features of the programming learning tools including the System Visibility (SV), User Control (UC), System Flexibility and Efficiency (SFE), System Reliability (SR) and System Interface (SI) on students' motivational and attainment level.

Since positive perfectionist students are expected to have higher levels on motivation and attainment, therefore three different batches of data were examined:

- Data with participation of all students
- Data with participation of students who are low-positive perfectionist
- Data with participation of students who are high-positive perfectionist

4.2 Reliability Test

Reliability tests were conducted to assess the consistency of the research results before further analysis take place. Cronbach's alpha was used to measure the internal consistency of the research instrument. There are three research instruments used in this study namely the Frost Multidimensional Perfectionism Scale (FMPS), the Instructional

Material Motivational Survey (IMMS) and the General Interface Usability Criteria (GIUC). For the FMPS, only two subscales were involved out of six subscales overall as this study only considered the positive perfectionisms traits. As for IMMS, there are three different tests for three different programming learning tools. The following is the statistics of the coefficient reliability for each of the subscale:

Instruments' Subscale	Cronbach's Alpha	N of Items
FMPS – Organization	.758	6
FMPS – Personal Standard	.681	5
IMMS – VB	.621	31
IMMS – Scratch	.651	36
IMMS - PyGame	.622	36
GUIC – SV	.886	5
GUIC – UC	.685	3
GUIC – SFE	.829	3
GUIC – SR	.929	3
GUIC - SI	.910	5

Table 4.1: Reliability Statistics for Each Instrument's Subscale

The cronbach's alpha above ranges from 0.621 to 0.929 after some item deletion for some of the subscales. Thus the reliability of the subscales is acceptable.

4.3 Demographic Profiles

A sample of 591 of secondary school students was involved in this research. The school is located in an urban area of Ipoh city. The selection of this school is based on the fact that the school's composition reflected the mix gender and multi races of the national schools composition available nationwide. Out of 591 students, 342 is the male which covers the 57.9 % of the research sample and the remaining 249 is the female or 42.1%.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	342	57.9	57.9	57.9
	Female	249	42.1	42.1	100.0
	Total	591	100.0	100.0	

Table 4.2: Students' Gender Analysis

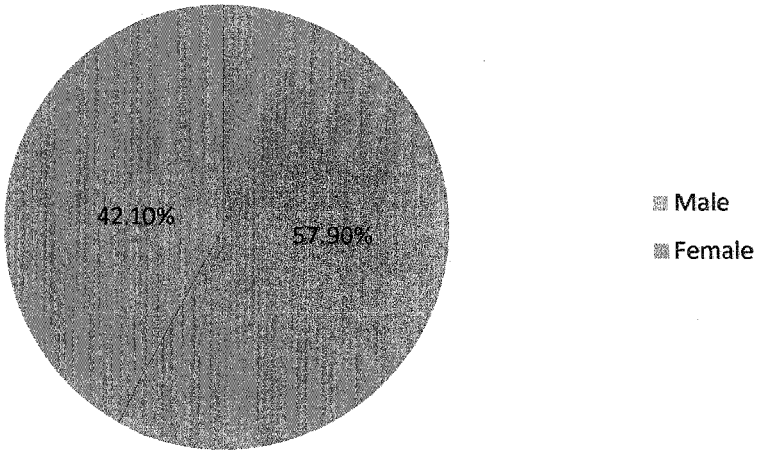

Figure 4.1: Students' Gender Percentage

In term of ethnicity, 375 are the Malay students, 153 Chinese and the balance 63 students are the Indian students.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Malay	375	63.5	63.5	63.5
	Chinese	153	25.9	25.9	89.3
	Indian	63	10.7	10.7	100.0
	Total	591	100.0	100.0	

Table 4.3: Students' Ethnicity Analysis

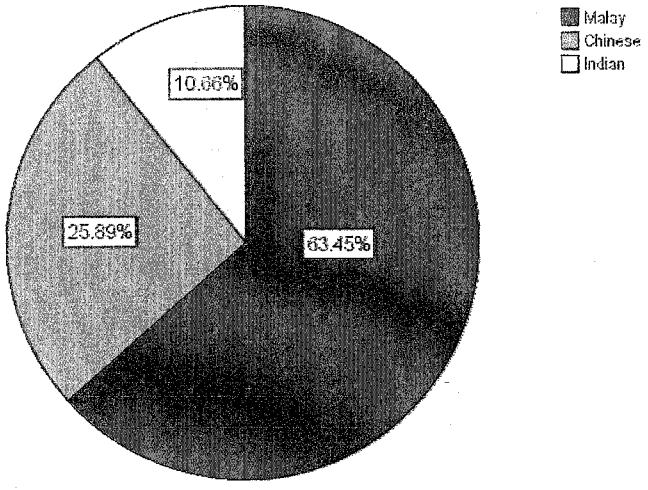

Figure 4.2: Students' Ethnicity Percentage

The research also categorized the sample into two distinct groups and the categorization is based on their perfectionisms tendency which is the low-positive and high-positive perfectionist. The students who score below the median score is considered as low-positive perfectionist while the students with the score above the median is considered as high-positive perfectionist. Considering the data that have been collected, the existence of extreme values does not make mean as a good measure. The median has been chosen as the median is not affected by the extreme values. For the low-positive perfectionist groups, there are 144 male and 114 female students while for the high-positive students, there are 198 male and 135 female students. The total numbers of students for both low-positive and high-positive perfectionist groups are 342 for low-positive and 249 for high-positive perfectionist group.

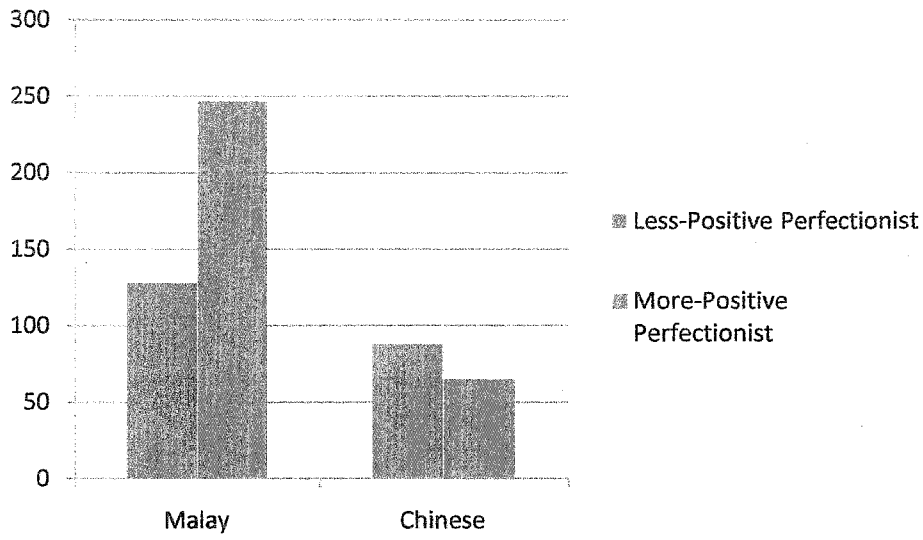

Figure 4.3: Students Perfectionisms According to Gender

The numbers of the students for both groups in term of ethinicity also being analyzed. For the low-positive perfectionist there is 128 Malays, 88 Chinese and 42 Indians while for the high-positive perfectionist the composition comprise of 247 Malays, 65 Chinese and 21 Indians.

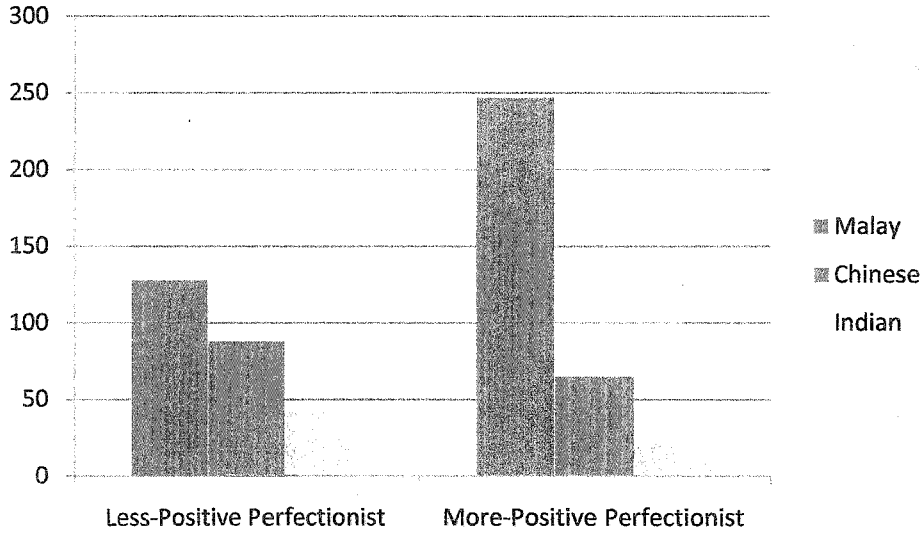

Figure 4.4: Students Perfectionisms According to Ethnicity

4.4 Hypothesis Testing

4.4.1 Hypothesis 1: Relationship between Programming Learning Tools and Motivational Level (All Students)

Table 4.4: Hypothesis Statement

Hyphotesis 1		Statement of Hypothesis
Null Hypothesis	H_0 $\mu1 = \mu2 = \mu3$	There is no significant differences for the motivational scores between the VB, Scratch and PyGame application for all students where - $\mu1$ is the mean for the motivational score of the VB - $\mu2$ is the mean for the motivational score of the Scratch - $\mu3$ is the mean for the motivational score of the PyGame
Alternate Hypothesis	Not all three means are equal	There is significant differences for the motivational scores between the VB, Scratch and PyGame application for all students where - $\mu1$ is the mean for the motivational score of the VB - $\mu2$ is the mean for the motivational score of the Scratch - $\mu3$ is the mean for the motivational score of the PyGame

The ANOVA result shows that there are significant differences between the programming learning tools at the $p<0.05$ level for the three conditions [$F(2, 588)$ =

431.92, p=0.000]. Table 4.5 shows that the pair having a significant differences if the *p-value* is less than 0.05.

Table 4.5: ANOVA Result

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	96781.442	2	48390.721	431.921	.000
Within Groups	65877.269	588	112.036		
Total	162658.711	590			

Table 4.6: Multiple Comparisons

(I) Program	(J) Program	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
VB	PG	-27.543(*)	1.067	.000	-29.64	-25.45
	SC	-26.731(*)	1.067	.000	-28.83	-24.64
PG	VB	27.543(*)	1.067	.000	25.45	29.64
	SC	.812	1.067	.447	-1.28	2.91
SC	VB	26.731(*)	1.067	.000	24.64	28.83
	PG	-.812	1.067	.447	-2.91	1.28

As the ANOVA shows significant differences, the *post hoc* test was run to determine which means were different. The results indicated that the mean score for the VB (M=75.30, SD=9.432) was significantly different than the Scratch (M=102.03, SD=11.309) and the PyGame (M=102.84, SD=10.920). However there is no significant difference between the Scratch and the PyGame application. These results indicated that the students having better motivational level using the project-based learning application (Scratch) and game-based learning application (PyGame) compared to the conventional learning application (VB). There is no significant difference between the project-based

learning application and the game-based learning application as both applications gave same effect to the students' motivational level.

4.4.2 Hypothesis 2: Relationship between Programming Learning Tools and Attainment Level (All Students)

Table 4.6: Hypothesis Statement

Hyphotesis 2		Statement of Hypothesis
Null Hypothesis	H_0 $\mu 1 = \mu 2 = \mu 3$	There is no significant differences for the attainment scores between the VB, Scratch and PyGame application for all students where - $\mu 1$ is the mean for the attainment score of the VB - $\mu 2$ is the mean for the attainment score of the Scratch - $\mu 3$ is the mean for the attainment score of the PyGame
Alternate Hypothesis	Not all three means are equal	There is significant differences for the attainment scores between the VB, Scratch and PyGame application for all students where - $\mu 1$ is the mean for the attainment score of the VB - $\mu 2$ is the mean for the attainment score of the Scratch - $\mu 3$ is the mean for the attainment score of the PyGame

A one-way between subjects ANOVA was conducted to compare the effects of learning tools on attainment score in VB, Scratch and PyGame application. The results

shows that there are significant differences between the tools at the $p<0.05$ level for the three conditions [$F(2, 588) = 125.07$, $p=0.000$]. Table 4.7 shows that the pair having a significant differences if the *p-value* is less than 0.05.

Table 4.7: ANOVA Result

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	527.475	2	263.738	125.073	.000
Within Groups	1239.898	588	2.109		
Total	1767.374	590			

Table 4.8: Multiple Comparisons

(I) Program	(J) Program	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
VB	PG	-2.198(*)	.146	.000	-2.49	-1.91
	SC	-1.726(*)	.146	.000	-2.01	-1.44
PG	VB	2.198(*)	.146	.000	1.91	2.49
	SC	.472(*)	.146	.001	.18	.76
SC	VB	1.726(*)	.146	.000	1.44	2.01
	PG	-.472(*)	.146	.001	-.76	-.18

As the ANOVA shows significant differences, the *post hoc* test would help to understand which means were different. Post hoc comparisons using LSD test indicated that the mean score for the attainment of the VB (M=3.41, SD=1.351) was significantly different than the Scratch (M=5.14, SD=1.524) and the PyGame (M=5.61, SD=1.476). These results indicated that the students achieve better using the project-based learning application (Scratch) and game-based learning application (PyGame) compared to the conventional learning application (VB). There is indication that the students will achieve different results while learning using different learning tools.

4.4.3 Hypothesis 3: Relationship between Programming Learning Tools and Motivation Level (Low-Positive Perfectionist Students)

Table 4.9: Hypothesis Statement

Hyphotesis 3		Statement of Hypothesis
Null Hypothesis	H_0 $\mu 1 = \mu 2 = \mu 3$	There is no significant differences for the motivational scores between the VB, Scratch and PyGame application for the low-positive perfectionist students where - $\mu 1$ is the mean for the motivational score of the VB - $\mu 2$ is the mean for the motivational score of the Scratch - $\mu 3$ is the mean for the motivational score of the PyGame
Alternate Hypothesis	Not all three means are equal	There is significant differences for the motivational scores between the VB, Scratch and PyGame application for the low-positive perfectionist students where - $\mu 1$ is the mean for the motivational score of the VB - $\mu 2$ is the mean for the motivational score of the Scratch - $\mu 3$ is the mean for the motivational score of the PyGame

The ANOVA result shows that there are significant differences between the tools at the $p<0.05$ level for the three conditions [$F(2, 255) = 205.211$, $p=0.000$]. Table 4.10 shows that the pair having a significant differences if the *p-value* is less than 0.05.

Table 4.10: ANOVA Result

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	44013.717	2	22006.859	205.211	.000
Within Groups	27346.221	255	107.240		
Total	71359.938	257			

The *post hoc* test was run since there are significant differences so that we can determine which means were different. The results indicated that the mean score for the motivational for the low-positive perfectionist students of the VB (M=75.52, SD=8.980) was significantly different than the Scratch (M=103.05, SD=11.280) and the PyGame (M=103.73, SD=10.634). In this analysis, I found out that there is no significant difference between the Scratch and the PyGame. From these data, we can say that the low-positive perfectionist students having better motivational level when using Scratch and PyGame compared to VB and the motivational level of the students is almost similar for the Scratch and the PyGame.

Table 4.11: Multiple Comparisons

(I) Program	(J) Program	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
VB	PG	-28.203(*)	1.580	.000	-31.31	-25.09
	SC	-27.523(*)	1.589	.000	-30.65	-24.39
PG	VB	28.203(*)	1.580	.000	25.09	31.31
	SC	.681	1.570	.665	-2.41	3.77
SC	VB	27.523(*)	1.589	.000	24.39	30.65
	PG	-.681	1.570	.665	-3.77	2.41

4.4.4 Hypothesis 4: Relationship between Programming Learning Tools and Attainment Level (Low-Positive Perfectionist Students)

Table 4.12: Hypothesis Statement

Hyphotesis 4		Statement of Hypothesis
Null Hypothesis	H_0 $\mu 1 = \mu 2 = \mu 3$	There is no significant differences for the attainment scores between the VB, Scratch and PyGame application for the low-positive perfectionist students where - $\mu 1$ is the mean for the attainment score of the VB - $\mu 2$ is the mean for the attainment score of the Scratch - $\mu 3$ is the mean for the attainment score of the PyGame
Alternate Hypothesis	Not all three means are equal	There is significant differences for the attainment scores between the VB, Scratch and PyGame application for the low-positive perfectionist students where - $\mu 1$ is the mean for the attainment score of the VB - $\mu 2$ is the mean for the attainment score of the Scratch - $\mu 3$ is the mean for the attainment score of the PyGame

The ANOVA result shows that there are significant differences between the tools at the $p<0.05$ level for the three conditions [$F(2, 255) = 52.873$, $p=0.000$]. Table 4.13 shows that the pair having a significant differences if the *p-value* is less than 0.05.

Table 4.13: ANOVA Result

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	224.552	2	112.276	52.873	.000
Within Groups	541.494	255	2.124		
Total	766.047	257			

Since there are significant differences, the *post hoc* test was run to determine which means were different. The post hoc test indicated that the mean score for the attainment for the low-positive perfectionist students of the VB (M=3.44, SD=1.374) was significantly different than the Scratch (M=5.23, SD=1.531) and the PyGame (M=5.58, SD=1.460) but there is no significant differences between the Scratch and the PyGame. Based on these results, the low-positive perfectionist students seem achieve better in their test after using the Scratch and PyGame application compared to the VB. Beside that the low-positive perfectionist students achieve almost similar results in their test.

Table 4.14: Multiple Comparisons

(I) Program	(J) Program	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
VB	PG	-2.139(*)	.222	.000	-2.58	-1.70
	SC	-1.792(*)	.224	.000	-2.23	-1.35
PG	VB	2.139(*)	.222	.000	1.70	2.58
	SC	.347	.221	.118	-.09	.78
SC	VB	1.792(*)	.224	.000	1.35	2.23
	PG	-.347	.221	.118	-.78	.09

4.4.5 Hypothesis 5: Relationship between Programming Learning Tools and Motivation Level (High-positive Perfectionist Students)

Table 4.15: Hypothesis Statement

Hyphotesis 5		Statement of Hypothesis
Null Hypothesis	H_0 $\mu1 = \mu2 = \mu3$	There is no significant differences for the motivational scores between the VB, Scratch and PyGame application for the high-positive perfectionist students where - $\mu1$ is the mean for the motivational score of the VB - $\mu2$ is the mean for the motivational score of the Scratch - $\mu3$ is the mean for the motivational score of the PyGame
Alternate Hypothesis	Not all three means are equal	There is significant differences for the motivational scores between the VB, Scratch and PyGame application for the high-positive perfectionist students where - $\mu1$ is the mean for the motivational score of the VB - $\mu2$ is the mean for the motivational score of the Scratch - $\mu3$ is the mean for the motivational score of the PyGame

The results shows that there are significant differences between the tools at the $p<0.05$ level for the three conditions [$F(2, 330) = 227.226$, $p=0.000$]. Table 4.16 shows that the pair having a significant differences if the *p-value* is less than 0.05.

Table 4.16: ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	52663.678	2	26331.839	227.226	.000
Within Groups	38241.643	330	115.884		
Total	90905.321	332			

The *post hoc* test was run to determine which means were different. Results listed in table 17 indicated that the mean score for the motivational for the high-positive perfectionist students of the VB (M=75.13, SD=9.790) was significantly different than the Scratch (M=101.24, SD=11.320) and the PyGame (M=102.13, SD=11.144). By refer to these results we also can see that there is no significant difference between the Scratch and the PyGame. For the high-positive perfectionist students, we can conclude that they are highly motivated using the Scratch and the PyGame application compared to VB and their motivation level in using Scratch and PyGame is similar.

Table 4.17: Multiple Comparisons

(I) Program	(J) Program	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
VB	PG	-26.996(*)	1.445	.000	-29.84	-24.15
	SC	-26.110(*)	1.439	.000	-28.94	-23.28
PG	VB	26.996(*)	1.445	.000	24.15	29.84
	SC	.885	1.452	.542	-1.97	3.74
SC	VB	26.110(*)	1.439	.000	23.28	28.94
	PG	-.885	1.452	.542	-3.74	1.97

4.4.6 Hypothesis 6: Relationship between Programming Learning Tools and Attainment Level (High-Positive Perfectionist Students)

Table 4.18: Hypothesis Statement

Hyphotesis 6		Statement of Hypothesis
Null Hypothesis	H_0 $\mu 1 = \mu 2 = \mu 3$	There is no significant differences for the attainment scores between the VB, Scratch and PyGame application for the high-positive perfectionist students where - $\mu 1$ is the mean for the attainment score of the VB - $\mu 2$ is the mean for the attainment score of the Scratch - $\mu 3$ is the mean for the attainment score of the PyGame
Alternate Hypothesis	Not all three means are equal	There is significant differences for the attainment scores between the VB, Scratch and PyGame application for the high-positive perfectionist students where - $\mu 1$ is the mean for the attainment score of the VB - $\mu 2$ is the mean for the attainment score of the Scratch - $\mu 3$ is the mean for the attainment score of the PyGame

The ANOVA results shows that there are significant differences between the tools at the $p<0.05$ level for the three conditions [$F(2, 330) = 71.876$, $p=0.000$]. Table 4.19 shows that the pair having a significant differences if the *p-value* is less than 0.05.

Table 4.19: ANOVA Result

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	303.511	2	151.756	71.876	.000
Within Groups	696.747	330	2.111		
Total	1000.258	332			

Having significant differences, the *post hoc* test was run to determine which means were different. The post hoc test indicated that the mean score for the attainment for the high-positive perfectionist students of the VB (M=3.39, SD=1.339) was significantly different than the Scratch (M=5.06, SD=1.521) and the PyGame (M=5.63, SD=1.495). Based on this outcome, it is clearly that the high-positive perfectionist students achieve better on the Scratch and PyGame application compared to the VB. The high-positive perfectionist students also achieve different score for both Scratch and PyGame application.

Table 4.20: Multiple Comparisons

(I) Program	(J) Program	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
VB	PG	-2.244(*)	.195	.000	-2.63	-1.86
	SC	-1.674(*)	.194	.000	-2.06	-1.29
PG	VB	2.244(*)	.195	.000	1.86	2.63
	SC	.570(*)	.196	.004	.18	.96
SC	VB	1.674(*)	.194	.000	1.29	2.06
	PG	-.570(*)	.196	.004	-.96	-.18

4.5 Relation of Application Features to the Students' Motivational and Attainment Level

A set of questionnaire was provided to the students to collect their response and learning experiences towards the features of the tools used in this research which is the VB, the Scratch and the PyGame. The questionnaire is the modification of the General Interface Usability Criteria for m-Learning application (Bekim Fetaji et. al, 2011). There are five subscales namely the System Visibility (SV), User Control (UC), System Flexibility and Efficiency (SFE), System Reliability (SR) and System Interface (SI).

A regression analysis test was run so that we can construct a regression model in predicting the value of dependant variables (motivational and attainment level) from the independent variables (application features). The results will be presented in three sub-sections to covers the all students, low-positive perfectionist and high-positive perfectionist students.

4.5.1 Prediction of Motivational and Attainment Level for All Students

A multiple regression was conducted with the following predictor variables: System Visibility (SV), User Control (UC), System Flexibility and Efficiency (SFE), System Reliability (SR) and System Interface (SI). The following tables show the results of the regression analysis for the prediction of motivation and attainment of overall students.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.768(a)	.590	.583	10.754

a Predictors: (Constant), Mean_SI, Mean_UC, Mean_SR, Mean_SV, Mean_SFE

ANOVA(b)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	47943.907	5	9588.781	82.909	.000(a)
	Residual	33308.420	288	115.654		
	Total	81252.327	293			

a Predictors: (Constant), Mean_SI, Mean_UC, Mean_SR, Mean_SV, Mean_SFE

b Dependent Variable: Motivation

Coefficients(a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	75.077	5.750		13.058	.000
	Mean_SV	-7.145	2.146	-.363	-3.329	.001
	Mean_UC	-3.203	2.755	-.105	-1.162	.246
	Mean_SFE	5.903	2.175	.346	2.715	.007
	Mean_SR	7.128	1.479	.554	4.818	.000
	Mean_SI	3.832	2.152	.179	1.781	.076

a Dependent Variable: Motivation

Motivational Level $= \beta_0 + \beta_1 SV + \beta_2 SFE + \beta_3 SR$

$= 75.077 + (-7.145SV) + (5.903SFE) + (7.128SR)$

$= 75.077 - 7.145SV + 5.903SFE + 7.128SR$

Three predictors give effect to the students' motivational level. For the system visibility (β=-7.145), the value indicated that as system visibility features decrease by one unit, motivational score of the students will increase 7.145 units. The second predictor is the system flexibility and efficiency. For the system flexibility and efficiency (β=5.903), the increase of one unit will increase the motivational score of the students for 5.903 units. The last predictor involved is the system reliability (β=7.128). Increase of one unit of system reliability will increase 7.128 units of motivational score.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.543(a)	.294	.282	1.487

a Predictors: (Constant), Mean_SI, Mean_UC, Mean_SR, Mean_SV, Mean_SFE

ANOVA(b)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	265.796	5	53.159	24.034	.000(a)
	Residual	637.010	288	2.212		
	Total	902.806	293			

a Predictors: (Constant), Mean_SI, Mean_UC, Mean_SR, Mean_SV, Mean_SFE

b Dependent Variable: Attainment

Coefficients(a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	5.524	.795		6.947	.000
	Mean_SV	-.180	.297	-.087	-.607	.545
	Mean_UC	-.805	.381	-.249	-2.113	.036
	Mean_SFE	.031	.301	.017	.104	.917
	Mean_SR	.968	.205	.714	4.732	.000
	Mean_SI	-.160	.298	-.071	-.539	.590

a Dependent Variable: Attainment

Attainment Level $= \beta_0 + \beta_1 UC + \beta_2 SR$

$= 5.524 + (-0.805UC) + (0.968SR)$

$= 5.524 - 0.805UC + 0.968SR$

For the user control features (β=-0.805), the beta value indicated that as user control features decrease by one unit, attainment score of the students will increase 0.058 unit. Meanwhile for the system reliability (β=0.968), the increase of one unit will also increase the attainment score of the students for 0.968 unit.

4.5.2 Prediction of Motivational and Attainment Level for Low-Positive Perfectionist Students

Another multiple regression analysis was run to predict the attainment and motivational score for the low-positive perfectionist students based on the following

predictor variables: System Visibility (SV), User Control (UC), System Flexibility and Efficiency (SFE), System Reliability (SR) and System Interface (SI).

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.800(a)	.639	.621	10.109

a Predictors: (Constant), Mean_SI, Mean_UC, Mean_SR, Mean_SV, Mean_SFE

ANOVA(b)

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	17931.828	5	3586.366	35.092	.000(a)
	Residual	10117.600	99	102.198		
	Total	28049.429	104			

a Predictors: (Constant), Mean_SI, Mean_UC, Mean_SR, Mean_SV, Mean_SFE

b Dependent Variable: Motivation

Coefficients(a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	61.876	8.656		7.148	.000
	Mean_SV	-10.140	3.172	-.508	-3.197	.002
	Mean_UC	1.438	3.985	.046	.361	.719
	Mean_SFE	9.746	3.525	.558	2.765	.007
	Mean_SR	3.954	2.374	.316	1.666	.099
	Mean_SI	4.999	3.293	.243	1.518	.132

a Dependent Variable: Motivation

Motivational Level $= \beta_0 + \beta_1 SFE$

$= 61.876 + (-10.140SV) + (9.746SFE)$

$= 61.786 - 10.140SV + 9.746SFE$

For the motivation of low-positive perfectionist students, there are two features involved which is the system visibility (β=-10.140) and the system flexibility and efficiency (β=10.396). A decrease of one unit of system visibility will increase 10.140 units of motivational score. For the system flexibility and efficiency, an increase one unit will increase 9.746 units of students' motivational level.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.551(a)	.303	.268	1.620

a Predictors: (Constant), Mean_SI, Mean_UC, Mean_SR, Mean_SV, Mean_SFE

ANOVA(b)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	113.119	5	22.624	8.623	.000(a)
	Residual	259.738	99	2.624		
	Total	372.857	104			

a Predictors: (Constant), Mean_SI, Mean_UC, Mean_SR, Mean_SV, Mean_SFE

b Dependent Variable: Attainment

Coefficients(a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	5.272	1.387		3.801	.000
	Mean_SV	-.066	.508	-.029	-.130	.897
	Mean_UC	-.868	.639	-.241	-1.360	.177
	Mean_SFE	-.288	.565	-.143	-.510	.611
	Mean_SR	.982	.380	.680	2.581	.011
	Mean_SI	.250	.528	.105	.474	.637

a Dependent Variable: Attainment

Attainment Level $= \beta_0 + \beta_1 SR$

$= 5.272 + (0.982SR)$

$= 5.272 + 0.982SR$

From the above data it is clearly show that there is positive relationship between the attainment score for the low-positive perfectionist students to the application features which is the system reliability. For the system reliability (β=0.982), an increase of one unit will increase 0.982 unit of students' attainment score.

4.5.3 Prediction of Motivational and Attainment Level for High-Positive Perfectionist Students

Regression analysis once again being run so that we can predict the attainment and motivational score of the high-positive perfectionist students based on five predictors variables which is the: System Visibility (SV), User Control (UC), System Flexibility and Efficiency (SFE), System Reliability (SR) and System Interface (SI). The following is the results of the analysis.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.759(a)	.577	.565	11.093

a Predictors: (Constant), Mean_SI, Mean_UC, Mean_SR, Mean_SV, Mean_SFE

ANOVA(b)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	30664.228	5	6132.846	49.838	.000(a)
	Residual	22519.010	183	123.055		
	Total	53183.238	188			

a Predictors: (Constant), Mean_SI, Mean_UC, Mean_SR, Mean_SV, Mean_SFE

b Dependent Variable: Motivation

Coefficients(a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	83.297	7.770		10.721	.000
	Mean_SV	-5.102	2.945	-.262	-1.732	.085
	Mean_UC	-6.517	3.824	-.215	-1.704	.090
	Mean_SFE	3.961	2.791	.235	1.419	.158
	Mean_SR	8.662	1.892	.664	4.577	.000
	Mean_SI	3.580	2.840	.163	1.260	.209

a Dependent Variable: Motivation

Motivational Level $= \beta_0 + \beta_1 SR$

$= 83.297 + (8.662SR)$

$= 83.297 + 8.662SR$

The positive relationship is discovered between the motivational score and the system reliability features for the high-positive perfectionist students. System reliability

(β=8.662) will affect the students' motivational level for 8.662 units as the system reliability increase for one unit.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.546(a)	.298	.279	1.424

a Predictors: (Constant), Mean_SI, Mean_UC, Mean_SR, Mean_SV, Mean_SFE

ANOVA(b)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	157.518	5	31.504	15.537	.000(a)
	Residual	371.054	183	2.028		
	Total	528.571	188			

a Predictors: (Constant), Mean_SI, Mean_UC, Mean_SR, Mean_SV, Mean_SFE

b Dependent Variable: Attainment

Coefficients(a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	5.507	.997		5.522	.000
	Mean_SV	-.299	.378	-.154	-.791	.430
	Mean_UC	-.665	.491	-.220	-1.355	.177
	Mean_SFE	.243	.358	.145	.679	.498
	Mean_SR	.958	.243	.737	3.944	.000
	Mean_SI	-.455	.365	-.208	-1.248	.214

a Dependent Variable: Attainment

Attainment Level $= \beta_0 + \beta_1 SR$

$= 5.507 + (0.958SR)$

$= 5.507 + 0.958SR$

In this case, we still can see the positive relationship between the attainment score and the system reliability features. For the high-positive perfectionist students, the system reliability (β=0.958) will affect their achievement as the increase of one unit of system reliability will increase 0.958 unit of their attainment score.

4.6 Summary of Data Analysis

Hypothesis	Significant	Accept/Reject
H_1: There is significant differences for the motivational scores between the VB, Scratch and PyGame application for all students	.000	Accept
H_2: There is significant differences for the attainment scores between the VB, Scratch and PyGame application for all students	.000	Accept
H_3: There is significant differences for the motivational scores between the VB, Scratch and PyGame application for the low-positive perfectionist students	.000	Accept
H_4: There is significant differences for the attainment scores between the VB, Scratch and PyGame application for the low-positive perfectionist students	.000	Accept
H_5: There is significant differences for the motivational scores between the VB, Scratch and PyGame application for the high-positive perfectionist students	.000	Accept
H_6: There is significant differences for the attainment scores between the VB, Scratch and PyGame application for the high-positive perfectionist students	.000	Accept

Table 4.22: Hypothesis Acceptance/Rejection Summary

Based on table 4.22, all six research hypotheses were accepted. Since the research focus on the using of different programming learning tools and their effect to the students

motivational and attainment level, significant differences were found between all the three tools used in this study.

4.7 Conclusion

ANOVA and *post hoc* tests was run to study the relationship between the variables involved in this research. First, using median split technique, the participated students were categorized according to their perfectionism traits: low-positive and high-positive perfectionist students. Secondly, ANOVA and *post hoc* tests were used to examine if the three different types of programming applications have influence on the students; levels of motivation and attainment. Finally, the regression analysis was conducted to understand the influence of the application features to the students' motivational and attainment level. This regression model serves as a predictive tool as to design a more appropriate programming tools attract students in learning programming in school.

CHAPTER 5

DISCUSSIONS

5.1 Introduction

This section presents the discussion on the findings. As highlighted in chapter 4, the analysis was done on three different categories of students: (1) all participated students, (2) low-positive perfectionist, and (3) high-positive perfectionist, the outline for this chapter is presented in a similar flow. This section also discusses the extent to which the features of the learning tools affect students' motivation and how they can help to motivate students to achieve better results. First, the demographic of the participated students is presented. Secondly, this chapter focuses on providing answers to the research questions. Finally, the chapter is concluded with the research implications and direction for future studies.

5.2 Description of the Research Sample

Sample study comprised of form-two students from a school in Ipoh city, Perak. This secondary school is composed with a multi-racial background with a majority of the students come from a middle class group. The rationale for selecting these sample students is based on the factor of their involvement in the Information and Communication Literacy (ICTL) program conducted in all secondary schools within Malaysia. These students are deemed to be the appropriate sample as they were exposed to the computer programming learning environment. Secondary school students aged between 13 and 16 are also considered fit and suitable to develop great interest in learning computer programming. In the Malaysian education system, the students are given chosen to select their specific areas of learning (e.g. to be in Sciences or Arts

stream) as early as at the form four level. Therefore, exposures to learning programming in early secondary level help the students to cultivate the interests in the area of learning computer programming.

A total of 591 respondents participated in this study. The majority of the respondents were male students representing 57.9% (a total of 342) while the rest are female students with the percentage of 42.1% (or 249). This percentage is fairly consistent to the overall gender composition of the school enrollment in which the male students is the majority. In terms of ethnicity, there are 375 Malay students, 153 Chinese students and 63 Indian students. This composition is represented with a share of 63.5% of Malay, 25.9% of Chinese and 10.7% for India. The respondents' composition in term of ethnicity reflected the overall multi ethnic composition for most schools in this country.

5.3 Students Perfectionisms and Their Responses (Motivation and Attainment) to the Different Programming Learning Tools

The first research question to be answered in this study associates with the students' trait of perfectionisms and their responses to the use of different programming learning tools. The primary focuses of this study was to determine the extent of uses of different learning applications in affecting the students' level of motivation and attainment. In this study the perfectionism trait for the two groups of students was divided into two categories: (1) low-positive perfectionist, and (2) high-positive perfectionist.

H1: There are significant differences in motivational scores of VB, Scratch and PyGame applications for all students

This hypothesis constructed with the aim to examine whether there are significant differences in the motivational scores between the three different programming learning tools for all students. The results from the ANOVA analysis showed that there was a significant difference among the three applications [F (2, 588) = 431.92, p = 0.00]. The findings in the study show that all the participated students scored differently in their

motivational level when using different learning applications. To explain the specific differences, *post hoc* test was conducted. The results of this analysis showed a significant differences in motivational level between VB application (M = 75.30, SD = 9.432), Scratch application (M = 102.03, SD = 11.309) and PyGame application (M = 102.84, SD = 10.920). We thus conclude that the students having a higher level of motivation when using game-based applications rather than project-based learning application. However, the students' motivational scores for Scratch and PyGame application did not differ significantly.

H2: There are significant differences in attainment scores of VB, Scratch and PyGame applications for all students

The second hypothesis aimed to examine the level of the attainment using different programming learning tools: VB, Scratch and PyGame. The results of the ANOVA analysis showed significant differences in the attainment level for all three applications [F (2, 588) = 125.07, p = 0.000]. This indicates that the students have different level of attainment based on the assessment carried out after students using the applications. Their level of understanding is reflected through their attainment scores. To explain these differences, *post hoc* test was needed. The results of *post hoc* test showed that students scored highest attainment level using PyGame application (M = 5.61, SD = 1.476), followed by Scratch application (M = 5.14, SD = 1.524) and VB application (M = 3.41, SD = 1.351). In this case, the use of conventional applications that is VB was seen to be less effective in enhancing students' understanding of learning which in turn affecting their attainment scored as compared to the use of alternative applications such as Scratch and PyGame.

H3: There are significant differences in the motivational level of VB, Scratch and PyGame applications for students with low-positive perfectionisms

This hypothesis was constructed to examine the relationship between the level of students' motivation using three different programming learning applications for the group of low-positive perfectionist students. The data were recorded and then was analyzed using ANOVA analysis to see if there are significant differences among the mean scores for each of the applications. The analysis showed significant differences for the three mean scores [F (2.255) = 205.211, p = 0.000]. This indicates that for the group of students with low-positive perfectionism, they show different levels of motivation in using different learning applications. *Post hoc* test further explained these differences. The students scored significantly lower in motivational level using VB application (M = 75.52) when compared to the students that used the Scratch application (M = 103.05, SD = 11.280) and PyGame application (M = 103.73, SD = 10.634). From these results, we can see that the low-positive perfectionist is more motivated to complete the tasks assigned to them using Scratch and PyGame application rather than conventional application VB.

H4: There are significant differences in the attainment level of VB, Scratch and PyGame applications for students with low-positive perfectionisms

The ANOVA analysis was conducted again to examine the relationship between the scores of students in their attainment level. The results of the analysis also showed significant differences between each of the applications used [F (2.255) = 52.873, p = 0.000]. Since there was a significant difference, post-hoc analysis was conducted to further explain the differences between each mean value. The post-hoc analysis showed that these low-positive perfectionist students score significantly lower in attainment using VB application (M = 3.44, SD = 1.374) as compared to the students that are using Scratch application (M = 5.23, SD = 1.531) and PyGame application (M = 5.58, SD = 1.460). Results of the analysis showed that there is no significant difference between the attainment scores of students using Scratch with PyGame application. So we conclude

that the students with low-positive perfectionist seems to learn better and able to achieve higher results when using Scratch and PyGame applications as compared to VB application.

H5: There are significant differences in the motivational scores of VB, Scratch and PyGame applications for students with high-positive perfectionisms

The second category of the students involved in this study is the high-positive perfectionist. The same analysis procedures were adopted. The ANOVA was carried out to examine if there was significant differences between the motivational level for each of the applications: VB, Scratch and PyGame. Results of the analysis for this group of students showed a significant difference between in the motivational scores [F (2.330) = 227.226, p = 0.000]. The students' motivational level varied when using different learning applications. Post-hoc analysis further explained that these students scored significantly lower in using VB applications [M = 75.13, SD = 9.790) when compared to using Scratch application [M = 101.24, SD = 11.320), and PyGame application [M = 102.13, SD = 11.144). They are deemed to be more motivated to learn programming when using Scratch and PyGame application.

H6: There are significant differences in the attainment scores of VB, Scratch and PyGame applications for students with high-positive perfectionism

The last ANOVA analysis was conducted on students' attainment level. Through this analysis we observed that there were significant differences in attainment level for each of the learning applications used. *Post hoc* test showed that the students having highest attainment level using the PyGame application (M = 5.63, SD = 1.495), followed by Scratch application (M = 5.06, SD = 1.521) and then by VB (M=3.39, SD = 1.339). This finding was slightly different as we found significance difference in the mean scores for attainment when using the Scratch and PyGame applications. This finding was not observed in other group of students (all students and low-positive perfectionist students).

	All students						Low-Positive Perfectionist						High-Positive Perfectionist					
	Motivation			Attainment			Motivation			Attainment			Motivation			Attainment		
	VB	Scratch	PyGame	VB	Scratch	PyGame	VB	Scratch	PyGame	VB	Scratch	PyGame	VB	Scratch	PyGame	VB	Scratch	PyGame
VB		√	√		√	√		√	√		√	√		√	√		√	√
Scratch	√		×	√		×	√		×	√		×	√		×	√		√
PyGame	√	×		√	×		√	×		√	×		√	×		√	√	

√: There was a significant difference
×: There was no significant difference

Table 5.1: Effects of Programming Learning Tools on Students' Motivation and Attainment Level

As shown in table 5.1, the findings was consistently highlighted that the motivational level are varied depending on the programming learning tools for three categories of students: (1) all students, (2) the low-positive perfectionist and, (3) high-positive perfectionist on the relationship between different learning applications while for the variation in attainment score, there are different findings discovered for the group of high-positive perfectionist. The use of project-based learning application (Scratch) and game-based application (PyGame) are seemed to have the same impacts on the motivational score of the students causing no significant difference between these two applications. At the same time, students seem to have low motivation when using VB application which leads to a significant difference in their score as compared to Scratch and PyGame application. For the attainment score, the students from the high-positive

perfectionist group seemed to have difference attainment for all three applications as there are significance differences between them.

5.4 The Relations between Application Features with Students' Motivational and Attainment Level

The second phase of this research study was focused on examining the relationship between the application features and their impact on students' motivational and attainment level. For this purpose, a questionnaire used to collect data which was adopted and slightly modified from the General Interface Usability Criteria (GIUC). Five subscales: System Visibility (SV), User Control (UC), System Flexibility and Efficiency (SFE), System Reliability (SR) and System Interface (SI) were used to measure the effectiveness of application design. The regression analysis was then used to construct a regression model that can be used to predict the levels of motivation and attainment with the given set of application features. The analysis was divided according to different categorization of the students; all students, low-positive perfectionist and high-positive perfectionist. Since there are differences in motivational and attainment level for each of the applications found in the analysis before, the regression analysis is needed to identify the features or parts in the application that gave effect to this value. The PyGame application for example provides an interactive environment to the students in which they can learn computer programming in playing mode. A sequence of level available in the application also encourages and motivates the students to learn more and try their best to complete their mission.

Regression Analysis on Student Motivational and Attainment Levels for All Students

Multiple regression analysis was conducted to examine the five prediction variables; System Visibility (SV), User Control (UC), System Flexibility and Efficiency (SFE), System Reliability (SR) and System Interface (SI) on the motivational and attainment level. The results of the analysis showed that only three variables have influences on the students' motivational level, which are, the System Visibility (SV), System Flexibility and Efficiency (SFE) and System Reliability (SR).

$$Motivational\ Level = 75.077 - 7.145SV + 5.903SFE + 7.128SR$$

This indicates that a reduction of 7.145 units for System Visibility features will increase student's motivational level by one unit while an increase of 5.903 units and 7.128 units respectively for System Flexibility and Efficiency (SFE) and System Reliability (SR) will increase one unit of the student's motivational score.

$$Attainment\ Scores = 5.524 - 0.805UC + 0.986SR$$

As for the relationship between GIUC features and attainment level, only two variables were found to be significant which are the User Control (UC) and System Reliability (SR) features. Reduction of 0.805 units for User Control (UC) features will increase the student's attainment level by one unit. At the same time, an increase of 0.968 units for reliability system will improve the student's level by one unit.

In conclusion, based on the sampling for all students participated in this study, it was found that different application features affected both the motivational and attainment scores. However, the System Reliability (SR) was the only feature that takes effect on both motivation and attainment scores.

Regression Analysis on Student Motivational and Attainment Levels for the Low-Positive Perfectionist Students

The second category of students that was analyzed using the regression analysis was the low-positive perfectionist students. Analytical procedures were conducted in accordance with the procedures as conducted on all the students.

$$Motivational\ Level = 61.786 - 10.140SV + 9.746SFE$$

For this group of students, it was found that two application features affect their motivational level in using the applications which is the System Visibility (SV) and System Flexibility and Efficiency (SFE) features. A reduction of 10.140 units of System Visibility (SV) will increase the students' motivational level by one unit, while an increase of 9.746 units for System Flexibility and Efficiency (SFE) features will increase the student's motivational level by one unit.

$$Attainment\ Level = 5.272 + 0.982SR$$

For attainment scores, only one feature was found to have significant effect on the improvement of the student's attainment score which is the System Reliability (SR) feature. An increase of 0.982 units of System Reliability (SR) will increase the value of the student's attainment level by one unit.

Regression Analysis on Student Motivational and Attainment Levels for the High-Positive Perfectionist Students

The same regression analysis procedures were carried out on another group of students which is the high-positive perfectionist.

$$Motivational\ Level = 83.297 + 8.662SR$$

For the students' motivational scores, only one variable which is the System Reliability (SR) feature that influence their motivational level. An increase of 8.662 units of System Reliability (SR) features will increase the student's motivational level by one unit.

Attainment Level = 5.507 + 0.958SR

Similar findings were obtained for the attainment level for this group of students. The analysis showed that only System Reliability (SR) feature will influence the student's attainment score. In this case, an increase of 0.958 units of System Reliability will increase the value of one unit of the student's attainment score.

	All Students		Low-Positive Perfectionist		High-Positive Perfectionist	
	Motivation	Attainment	Motivation	Attainment	Motivation	Attainment
SV	√		√			
UC		√				
SFE	√		√			
SR	√	√		√	√	√
SI						

√: having effect on the students' motivational and attainment level

Table 5.2: Relation of Applications' Features to the Students' Motivational and Attainment Level

Table 5.2 shows the results of the regression analyses on the relationship between application features and the students' motivational and attainment level for all categories of students. The System Reliability (SR) feature was consistently found to be an important feature in determining the scores for motivation and attainment. Therefore, we conclude that in choosing any programming learning applications, the educators should emphasize on choosing the applications that have a high level of durability. Reliable system will ensure that the students can have a smooth learning process and prevent any upset for any possible of unstable program.

5.5 Conclusion

This section discussed the results of the ANOVA analysis conducted on the data collected to examine the relationship and differences that exist for the motivational and attainment level of the students using three different learning applications. The analysis conducted on data for all the participated students in the study and the two groups of students categorized according to their psychological tendency where these students were splited into low-positive perfectionist and high-positive perfectionist groups. In this section, the discussion extended to the findings from regression analysis which carried out to examine the extent to which the application features in affect the students' level of motivation and attainment. Finally, a regression model was constructed to predict the output value of the students' motivational and attainment level in learning programming.

CHAPTER 6

CONCLUSION

6.1 Introduction

Discussion on the research findings and analysis on the results were provided in the previous chapter. Also provided is the discussion on the relationship between application features to the students' level of motivation and attainment. This chapter presents a summary of the research, the main contribution including the theoretical and practical contribution. The research limitations and the suggestion on the future works are included.

6.2 Research Summary

The importance of Information and Communication Technology (ICT) in life is increasing from the early days until the emergence of recent technology. These situations can be seen by the rapid development of technology as well as the high demand for technologies that can facilitate and help humans in their daily life. In order to ensure that our country is moving in line with the rapid development of this technology, we have to ensure that there is available talent to handle such technology and most importantly we can produce someone that is capable to invent such technology. Starting from the school level, the tendency and interest in information technology should be adopted to increase the number of skilled workers in the ICT sector. The basis of this technology is by mastering computer programming and this process should be something that is easy and interesting to ensure that the students' interest to pursue such knowledge can be nurtured.

Current situation in school shows that the teachers do not have much option in choosing the learning tools. This may occur due to education community itself does not aware with the existence of a variety of programming learning tools developed by different communities. The differences between different learning applications must be understood and through this research the differences have been identified and the effectiveness of the applications used in increasing student motivation and attainment has also been identified.

Students with a variety of psychological tendencies are seen to have different requirements in any learning process. In the context of this study, the group of students with perfectionism trait has been selected to be the research subjects with their response to the learning tools have been observed and analyzed. This research aimed to study the positive perfectionism trait based on the findings which showed that there is a positive association between positive perfectionism trait to the students' level of motivation and attainment. This study also categorized the students into two main groups, low-positive perfectionist and high-positive perfectionist. The classification of the students was made by using the Frost Multidimensional Perfectionisms Scale (FMPS).

In addition, the study also tested the effect of application features to the students' learning experience especially on their motivational and attainment level. Several features have been tested and the result shows that the System Reliability (SR) feature is the key feature that affects student learning experience. Through this study regression models were developed to predict the levels of motivation and attainment of the students in learning computer programming in schools.

6.3 Research Contributions

The research contribution is presented in the following subtopic as theoretical and practical contribution.

Theoretical Contribution

Theoretical framework is the important component in guiding the directions of this research study. There are two initial theories which became the threshold of this study. The first theory is regarding the availability of several indicators which show that the multimedia and interactive applications can create different learning experience and thus enhance the students' motivation in learning computer programming. In addition the second theory is based on the finding that there is relationship between positive perfectionisms to the students' level of motivation and attainment. The research by Alison Ram (2005) suggested a positive relationship between the positive perfectionism trait to the students' level of motivation and achievement. We may just take for granted the issue of the psychological tendency of the students in the learning process before, but through this study, the researcher hopes that the interest towards the study on this field can be increased and at the same time encourage the education community to conduct further study on this domain.

The main experience that researcher gained through this study is the opportunity to see how the interaction between humans and computers were established. The finding by Alison Ram were developed and applied to the research framework. Through this study, the researcher manages to learn on how to integrate the two domains which is the ICT and psychology aspect and include them into the main research framework. Apart from that, the researcher gain an experience on how to develop an evaluation procedure so that the differences between several learning tools can be examined and how the comparison is made in terms of their effectiveness in increasing students' level of motivation and attainment. The community should now realize that there was a different category of students with different psychological tendencies. The extent to which this psychological tendency affects the learning process should be observed to enable the educators to identify them thus providing an appropriate learning medium to the students.

The educators must also recognize that different features existed on each of the learning tools can influenced the students' motivation and at the same time affect their attainment results. It is really hoping that the findings of this study will be able to provide

an input to the education community in the effort to improve the learning of computer programming in schools.

The second theoretical contribution that can be identified is by the method of classifying students into two main groups; low-positive perfectionist and high-positive perfectionist. Classification is made based on the median value where the students who score below the median scores were categorized as low-positive perfectionist while students who achieved a score above the median value will be categorized as high-positive perfectionist.

Practical Contribution

In terms of practical, the contribution of this study is reflected in the results of the study which indicate that the project-based learning application (Scratch) and games-based learning application (PyGame) is more appealing to students thus increase their motivation and attainment compared to conventional application (VB). This finding is valuable to provide greater insights to the education community in choosing suitable learning tools in school and thus enhance the learning outcomes.

Another contribution obtained as a result of this study is the regression model which can be used by the educators to predict the students' motivational and attainment level and the regression model provided were constructed for all students , the low-positive perfectionist and high-positive perfectionist students.

6.4 Limitations and Future Works

The objective of this study has been achieved subject to certain limitations. Limitations of this study are as listed below and recommendations for future work were provided together.

1. This study only conducted on a sample of respondents from one secondary school and cannot be generalized to all schools in the country since the level of student competence

in using computer may be differ between rural and urban areas. This study could not be implemented in other schools as there was a need to obtain an approval from the school administration to use the computers and their lab as well as we needs to take into consideration the time of the students' engagement in this research. For future work an approval should be obtained from the Ministry of Education to enable more comprehensive access to different school at different locations.

2. The data collection included all students, low-positive perfectionist and high-positive perfectionist students. Thus the findings of this study are only valid for positive perfectionism trait and should not be used for any other psychological tendencies. Further studies are needed to examine the other psychological traits on students' learning experience.

3. The relationship between the features of the application with students' motivational and attainment level involves several aspects consisted of System Visibility (SV), User Control (UC), System consistency (SC), Error Prevention (EP), System Flexibility and Efficiency (SFE), System Reliability (SR) and System Interface (SI). System Consistency (SC) and Error Prevention (EP) features were released from the research analysis as they have low reliability score. Further study should be done to look into another feature that exists in programming learning applications which can influence the students' level of motivation and attainment.

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APPENDIX A

Frost Multidimensional Perfectionism Scale (FMPS)

Name: ..... Class: .....

Please indicate the degree to which you agree with each statement. Use the scale below, ranging from 1 to 5, in giving your answers. Circle the appropriate number for each statement.

Sila nyatakan sejauh mana anda bersetuju dengan kenyataan dibawah. Gunakan skala di bawah, antara 1 hingga 5 dalam memberi jawapan anda. Bulatkan nombor yang sesuai bagi setiap pernyataan.

		Strongly Disagree/ Sangat Tidak Setuju	Disagree/ Tidak Setuju	Neutral/ Neutral	Agree/ Setuju	Strongly Agree/ Sangat Setuju
1	My parents set very high standards for me / Ibu bapa saya menetapkan tahap yang sangat tinggi bagi diri saya	1	2	3	4	5
2	Organization is very important to me / Pengurusan adalah sangat penting kepada saya	1	2	3	4	5
3	As a child, I was punished for doing things less than perfect / Sebagai seorang anak, saya telah dihukum kerana melakukan perkara yang kurang sempurna	1	2	3	4	5
4	If I do not set the highest standards for myself, I am likely to end up a second-rate person / Jika saya tidak menetapkan tahap tertinggi untuk diri sendiri, saya mungkin akan berakhir sebagai orang kedua	1	2	3	4	5
5	My parents never tried to understand my mistakes / Ibu bapa saya tidak pernah cuba untuk memahami kesilapan saya	1	2	3	4	5
6	It is important to me that I am thoroughly competent in everything I do / Adalah penting kepada saya bahawa saya benar-benar kompeten dalam semua perkara yang saya lakukan	1	2	3	4	5
7	I am a neat person / Saya seorang yang kemas	1	2	3	4	5
8	I try to be an organized person / Saya cuba untuk menjadi seorang yang terurus	1	2	3	4	5
9	If I fail at school, I am a failure as a person / Jika saya gagal di sekolah, saya adalah gagal sebagai individu	1	2	3	4	5

10	I should be upset if I make a mistake / Saya harus merasa sedih jika saya membuat kesilapan	1	2	3	4	5
11	My parents wanted me to do the best at everything / Ibu bapa saya mahu saya lakukan yang terbaik dalam semua perkara	1	2	3	4	5
12	I set higher goals than most people / Saya menetapkan matlamat yang lebih tinggi daripada kebanyakan orang lain	1	2	3	4	5
13	If someone does a task at school better than I, then I feel like I failed the whole task / Jika seseorang melakukan tugas di sekolah lebih baik daripada saya, maka saya merasakan saya gagal keseluruhan tugasan itu	1	2	3	4	5
14	If I fail partly, it is as bad as being a complete failure / Jika saya gagal sebahagiannya, ianya seperti saya telah gagal keseluruhannya	1	2	3	4	5
15	Only outstanding performance is good enough in my family / Hanya prestasi cemerlang diterima dalam keluarga saya	1	2	3	4	5
16	I am very good at focusing my efforts on attaining a goal / Saya sangat bagus dalam menumpukan usaha saya untuk mencapai matlamat	1	2	3	4	5
17	Even when I do something very carefully, I often feel that it is not quite right / Apabila saya melakukan sesuatu dengan cermat, saya sering merasakan bahawa ia masih tidak betul	1	2	3	4	5
18	I hate being less than the best at things / Saya benci menjadi kurang terbaik pada sesuatu perkara	1	2	3	4	5
19	I have extremely high goals / Saya mempunyai matlamat yang sangat tinggi	1	2	3	4	5
20	My parents have expected excellence from me / Ibu bapa saya menjangka yang terbaik daripada saya	1	2	3	4	5
21	People will probably think less of me if I make a mistake / Orang mungkin kurang berfikir tentang saya jika saya membuat kesilapan	1	2	3	4	5
22	I never felt like I could meet my parents' expectations / Saya tidak pernah rasa saya akan dapat memenuhi harapan ibu bapa saya	1	2	3	4	5
23	If I do not do as well as other people, it means I am an inferior human being / Jika saya tidak melakukan seperti orang lain, ia bermakna saya	1	2	3	4	5

	adalah seorang manusia yang rendah mutu					
24	Other people seem to accept lower standards than I do / Orang lain seolah-olah boleh menerima tahap yang lebih rendah berbanding apa yang saya boleh terima	1	2	3	4	5
25	If I do not do well all the time, people will not respect me / Jika saya tidak melalukan yang terbaik sepanjang masa, orang lain tidak akan menghormati saya	1	2	3	4	5
26	My parents have always had higher expectations for my future than I have / Ibu bapa saya sentiasa mempunyai harapan yang lebih tinggi untuk masa depan saya berbanding apa yang saya sasar	1	2	3	4	5
27	I try to be a neat person / Saya cuba untuk menjadi orang yang kemas	1	2	3	4	5
28	I usually have doubts about the simple everyday things I do / Saya biasanya mempunyai keraguan tentang perkara-perkara mudah yang saya lakukan setiap hari	1	2	3	4	5
29	Neatness is very important to me / Kekemasan adalah sangat penting kepada saya	1	2	3	4	5
30	I expect higher performance in my daily tasks than most people / Saya mensasarkan prestasi yang lebih tinggi dalam tugasan harian saya daripada kebanyakan orang lain	1	2	3	4	5
31	I am an organized person / Saya seorang yang terurus	1	2	3	4	5
32	I tend to get behind in my work because I repeat things over and over / Saya cenderung untuk ketinggalan dalam kerja saya kerana saya kerapkali melakukan perkara yang sama berualang kali	1	2	3	4	5
33	It takes me a long time to do something "right" / saya mengambil masa yang lama untuk melakukan sesuatu yang "betul"	1	2	3	4	5
34	The fewer mistakes I make, the more people will like me / Semakin sedikit kesilapan yang saya buat, semakin ramai orang yang akan menyukai saya	1	2	3	4	5
35	I never felt like I could meet my parents' standards / Saya tidak pernah rasa saya akan dapat memenuhi apa yang diharapkan ibu bapa saya	1	2	3	4	5

APPENDIX B

Instructional Material Motivational Survey (IMMS)

Name: ..... Class: .....

Please indicate the degree to which you agree with each statement. Use the scale below, ranging from 1 to 5, in giving your answers. Write the appropriate number for each statement.

Sila nyatakan sejauh mana anda bersetuju dengan kenyataan dibawah. Gunakan skala di bawah, antara 1 hingga 5 dalam memberi jawapan anda. Tuliskan nombor yang sesuai bagi setiap pernyataan.

Scoring: Not true - 1; Slightly true - 2; Moderately true - 3; Mostly true - 4; Very true -5

No.	Pernyataan/Statement	Skor/Score
1	When I look to this application for the first time, I've an expection that it was easy to me *Apabila saya mula-mula melihat perisian ini, saya mempunyai tanggapan bahawa ianya mudah bagi saya.*	
2	There is something interresting at the beginning of this class that attracted my attention *Terdapat sesuatu yang menarik pada permulaan kelas ini yang menarik perhatian saya*	
3	This application is possibly hard to understand not like what I'm expecting *Perisian ini mungkin lebih sukar untuk difahami daripada apa yang saya jangkakan*	
4	At the end of this class, I'm confident that I know what I should gain from this class *Di akhir kelas ini, saya merasa yakin bahawa saya tahu apa yang sepatutnya saya belajar dari kelas ini*	
5	It's a pleasure for me to engage in this class till the end *Saya mendapat kepuasan dengan mengikuti kelas ini sehingga habis*	
6	It is clear to me on how the content of this application having relation with the things that I already know *Adalah jelas kepada saya bagaimana kandungan perisian ini mempunyai kaitan dengan perkara yang saya sudah tahu*	
7	Most of the module in this application having too much information and I ended up with a difficulties to choose and to remember the important things *Kebanyakan modul perisian ini mempunyai begitu banyak maklumat sehinga amat sukar untuk memilih dan mengingati perkara penting*	
8	This application is really interesting *Perisian ini sangat menarik perhatian*	
9	There is stories, pictures or example that show on how this application is important for some peoples	

	Terdapat cerita-cerita, gambar atau contoh-contoh yang menunjukkan bagaimana perisian ini mungkin penting bagi sesetengah orang	
10	To succesfully accomplished my assignment in this class is really important to me *Menyelesaikan tugasan dengan berjaya dalam kelas ini adalah penting kepada saya*	
11	The quality of this application has helped to retain my focus *Kualiti perisian ini membantu untuk mengekalkan fokus saya*	
12	The content of this application is too abstract and make it difficult for me to retain my focus *Kandungan perisian ini begitu abstrak hingga menyukarkan saya mengekalkan tumpuan*	
13	While using this application, I'm confident that I can mastered it *Semasa saya menggunakan perisian ini, saya yakin bahawa saya boleh menguasainya*	
14	I'm happy to using this application and looking forward to learn more *Saya gembira menggunakan perisian ini dan saya ingin belajar lebih lanjut mengenai perisian ini*	
15	This application is not interesting to be used *Perisian ini kelihatan tidak menarik untuk digunakan*	
16	The content of this application suit my interest *Kandungan perisian ini bersesuaian dengan minat saya*	
17	The way the information being arrange on the screen has retain my focus *Cara maklumat disusun pada skrin membantu mengekalkan perhatian saya*	
18	There is an explanation or examples on how humans can manipulate their knowledge in this class *Terdapat penjelasan atau contoh-contoh bagaimana manusia menggunakan pengetahuan dalam kelas ini*	
19	The activities in this class is too hard *Aktiviti-aktiviti dalam kelas ini terlalu sukar*	
20	There is several things in this class that stimulate my curiosity *Kelas ini mempunyai beberapa perkara yang merangsang rasa ingin tahu saya*	
21	I'm really happy to be able to learn this application *Saya benar-benar gembira mempelajari perisian ini*	
22	The repetition in this class has caused my bored sometimes *Jumlah pengulangan di dalam kelas ini menyebabkan saya bosan kadang-kala*	
23	The content and the information in this application has given a good impression that it is worth to learn it *Kandungan dan gaya maklumat dalam perisian ini memberi gambaran bahawa ianya bernilai untuk dipelajari*	
24	I learn a few things that is unexpected *Saya mempelajari beberapa perkara yang mengejutkan atau yang tidak saya sangka*	
25	After using this application, I'm sure that I can easily pass any exam related *Selepas menggunakan perisian ini untuk beberapa ketika, saya yakin bahawa saya akan dapat lulus jika ada ujian berkaitan yang*	

	dilakukan	
26	The content of this application is not relevent to my need as I already know most of them *Kandungan perisian ini tidak relevan dengan keperluan saya kerana saya sudah tahu kebanyakan darinya*	
27	The feedback available in this application has helped me to feel reward for my effort *Kata-kata maklum balas dalam perisian ini membantu saya berasa dihargai atas usaha saya*	
28	The exercise and various illustration has helped me to retain my focus to this class *Latihan dan ilustrasi yang pelbagai membantu mengekalkan perhatian saya pada kelas ini*	
29	The way information being laid out in this application is really bored *Kaedah penyampaian maklumat dalam perisian ini adalah membosankan*	
30	I can realte the things I learn from this class to something that I already saw, done or something that I've think in my personal life *Saya boleh mengaitkan isi kandungan pelajaran dalam kelas ini kepada perkara-perkara yang saya telah lihat, lakukan, atau yang pernah saya fikirkan dalam hidup saya sendiri*	
31	There are too much function in every module and it's irritating *Terdapat begitu banyak fungsi di dalam setiap modul dan ia menjengkelkan*	
32	I'm happy that I'm able to accomplished the assignment given in this class *Saya sangat gembira dapat menyelesaikan tugasan yang diberi dalam kelas ini*	
33	This application is really useful to me *Perisian ini sangat berguna kepada saya*	
34	There are several things that I'm not understand in this application *Terdapat beberapa perkara yang saya tidak fahami dalam perisian ini*	
35	The good arrangement of content in this application has enable me to increase my confident to learn it *Penyusunan kandungan yang baik dalam perisian ini membantu menambah keyakinan saya untuk mempelajarinya*	
36	It is a fun to use this properly developed application *Adalah satu keseronokan untuk menggunakan perisian ini yang telah direka dengan baik*	

APPENDIX C

General Interface Usability Criteria (GIUC)

Name: ..... Class: .....

Please indicate the degree to which you agree with each statement. Use the scale below, ranging from 1 to 5, in giving your answers. Put your scale in the column provided.

Sila nyatakan sejauh mana anda bersetuju dengan setiap kenyataan. Gunakan skala di bawah, antara 1 hingga 5 dalam memberi jawapan anda. Tuliskan skala yang sesuai dalam ruangan yang disediakan.

1-Strongly Disagree; 2-Disagree; 3-Neutral; 4-Agree; 5-Strongly Agree

No.	Item	Scale
System Visibility		
1.	The system keeps me informed about what is going on	
2.	The feedback is given on time and right	
3.	The important information is visible within the interface	
4.	The results of each operation I perform are visible	
5.	The system's interface does not attract much attention (with too much colors, or animations, graphics)	
User Control		
6.	I can control the system	
7.	I can exit the system at any time even when I've made mistakes	
8.	There are facilities for Undo and Redo	
System Consistency		
9.	The interface design is consistent for all modules available	
10.	The functionality structure is consistent throughout the overall design	
11.	The navigation is natural and easy	

Error Prevention		
12.	I do not easily make serious errors	
13.	When I make an error, the application gives me an appropriate error message	
14.	Every features is accompanied with clear instruction message	
System Flexibility and Efficiency		
15.	The system accommodates different levels of users, from novice to experts	
16.	Shortcuts are provided without attracting attention	
17.	The speed of the system performance is stable even in multitasking mode	
System Reliability		
18.	I can understand easily the error messages	
19.	I can quickly, and in a simple manner get recovered from errors	
20.	If I typed a command which results in an error, I do not need to retype the entire command, but repair only the faulty part.	
System Interface		
21.	There is back (to previous page or screen) and exit option	
22.	Colors are used attentively and do not attract disturb my attention to my work	
23.	The information in the system's interface is located in accordance with devices' interface information appearance	
24.	Opportunities to change the font size and type, colours and brightness are provided	
25.	The colour contrast of background and foreground is visible and easy perceptible	

APPENDIX D

Oneway

Descriptives

Motivation

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
VB	197	75.30	9.432	.672	73.97	76.62	53	100
PG	197	102.84	10.920	.778	101.31	104.38	75	132
SC	197	102.03	11.309	.806	100.44	103.62	77	137
Total	591	93.39	16.604	.683	92.05	94.73	53	137

ANOVA

Motivation

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	96781.442	2	48390.721	431.921	.000
Within Groups	65877.269	588	112.036		
Total	162658.711	590			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: Motivation
LSD

(I) Program	(J) Program	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
VB	PG	-27.543(*)	1.067	.000	-29.64	-25.45
	SC	-26.731(*)	1.067	.000	-28.83	-24.64
PG	VB	27.543(*)	1.067	.000	25.45	29.64
	SC	.812	1.067	.447	-1.28	2.91
SC	VB	26.731(*)	1.067	.000	24.64	28.83
	PG	-.812	1.067	.447	-2.91	1.28

* The mean difference is significant at the .05 level.

Oneway

Descriptives

Attainment

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
VB	197	3.41	1.351	.096	3.22	3.60	0	7
PG	197	5.61	1.476	.105	5.40	5.82	2	9
SC	197	5.14	1.524	.109	4.92	5.35	0	8
Total	591	4.72	1.731	.071	4.58	4.86	0	9

ANOVA

Attainment

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	527.475	2	263.738	125.073	.000
Within Groups	1239.898	588	2.109		
Total	1767.374	590			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: Attainment
LSD

(I) Program	(J) Program	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
VB	PG	-2.198(*)	.146	.000	-2.49	-1.91
	SC	-1.726(*)	.146	.000	-2.01	-1.44
PG	VB	2.198(*)	.146	.000	1.91	2.49
	SC	.472(*)	.146	.001	.18	.76
SC	VB	1.726(*)	.146	.000	1.44	2.01
	PG	-.472(*)	.146	.001	-.76	-.18

* The mean difference is significant at the .05 level.

Oneway

Descriptives

Motivation

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
VB	84	75.52	8.980	.980	73.58	77.47	53	100
PG	88	103.73	10.634	1.134	101.47	105.98	80	132
SC	86	103.05	11.280	1.216	100.63	105.47	77	137
Total	258	94.32	16.663	1.037	92.27	96.36	53	137

ANOVA

Motivation

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	44013.717	2	22006.859	205.211	.000
Within Groups	27346.221	255	107.240		
Total	71359.938	257			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: Motivation
LSD

(I) Program	(J) Program	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
VB	PG	-28.203(*)	1.580	.000	-31.31	-25.09
	SC	-27.523(*)	1.589	.000	-30.65	-24.39
PG	VB	28.203(*)	1.580	.000	25.09	31.31
	SC	.681	1.570	.665	-2.41	3.77
SC	VB	27.523(*)	1.589	.000	24.39	30.65
	PG	-.681	1.570	.665	-3.77	2.41

* The mean difference is significant at the .05 level.

Oneway

Descriptives

Attainment

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
VB	84	3.44	1.374	.150	3.14	3.74	1	7
PG	88	5.58	1.460	.156	5.27	5.89	2	9
SC	86	5.23	1.531	.165	4.90	5.56	0	8
Total	258	4.77	1.726	.107	4.56	4.98	0	9

ANOVA

Attainment

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	224.552	2	112.276	52.873	.000
Within Groups	541.494	255	2.124		
Total	766.047	257			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: Attainment
LSD

(I) Program	(J) Program	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
VB	PG	-2.139(*)	.222	.000	-2.58	-1.70
	SC	-1.792(*)	.224	.000	-2.23	-1.35
PG	VB	2.139(*)	.222	.000	1.70	2.58
	SC	.347	.221	.118	-.09	.78
SC	VB	1.792(*)	.224	.000	1.35	2.23
	PG	-.347	.221	.118	-.78	.09

* The mean difference is significant at the .05 level.

Oneway

Descriptives

Motivation

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
VB	113	75.13	9.790	.921	73.31	76.96	53	100
PG	109	102.13	11.144	1.067	100.01	104.24	75	132
SC	111	101.24	11.320	1.074	99.11	103.37	77	137
Total	333	92.67	16.547	.907	90.89	94.46	53	137

ANOVA

Motivation

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	52663.678	2	26331.839	227.226	.000
Within Groups	38241.643	330	115.884		
Total	90905.321	332			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: Motivation
LSD

(I) Program	(J) Program	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
VB	PG	-26.996(*)	1.445	.000	-29.84	-24.15
	SC	-26.110(*)	1.439	.000	-28.94	-23.28
PG	VB	26.996(*)	1.445	.000	24.15	29.84
	SC	.885	1.452	.542	-1.97	3.74
SC	VB	26.110(*)	1.439	.000	23.28	28.94
	PG	-.885	1.452	.542	-3.74	1.97

* The mean difference is significant at the .05 level.

Oneway

Descriptives

Attainment

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
VB	113	3.39	1.339	.126	3.14	3.64	0	7
PG	109	5.63	1.495	.143	5.35	5.92	2	9
SC	111	5.06	1.521	.144	4.78	5.35	1	8
Total	333	4.68	1.736	.095	4.49	4.87	0	9

ANOVA

Attainment

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	303.511	2	151.756	71.876	.000
Within Groups	696.747	330	2.111		
Total	1000.258	332			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: Attainment
LSD

(I) Program	(J) Program	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
VB	PG	-2.244(*)	.195	.000	-2.63	-1.86
	SC	-1.674(*)	.194	.000	-2.06	-1.29
PG	VB	2.244(*)	.195	.000	1.86	2.63
	SC	.570(*)	.196	.004	.18	.96
SC	VB	1.674(*)	.194	.000	1.29	2.06
	PG	-.570(*)	.196	.004	-.96	-.18

* The mean difference is significant at the .05 level.

Regression Statistics – All Students

Descriptive Statistics

	Mean	Std. Deviation	N
Motivation	93.63	16.653	294
Mean_SV	3.3204	.84695	294
Mean_UC	3.8107	.54392	294
Mean_SC	3.8798	.47532	294
Mean_SFE	3.3299	.97620	294
Mean_SR	3.3639	1.29474	294
Mean_SI	2.8308	.77653	294

Correlations

		Motivation	Mean_SV	Mean_UC	Mean_SC	Mean_SFE	Mean_SR	Mean_SI
Pearson Correlation	Motivation	1.000	.312	.283	.273	.627	.733	.615
	Mean_SV	.312	1.000	.907	.883	.816	.630	.776
	Mean_UC	.283	.907	1.000	.789	.757	.587	.728
	Mean_SC	.273	.883	.789	1.000	.751	.574	.733
	Mean_SFE	.627	.816	.757	.751	1.000	.900	.884
	Mean_SR	.733	.630	.587	.574	.900	1.000	.881
	Mean_SI	.615	.776	.728	.733	.884	.881	1.000
Sig. (1-tailed)	Motivation	.	.000	.000	.000	.000	.000	.000
	Mean_SV	.000	.	.000	.000	.000	.000	.000
	Mean_UC	.000	.000	.	.000	.000	.000	.000
	Mean_SC	.000	.000	.000	.	.000	.000	.000
	Mean_SFE	.000	.000	.000	.000	.	.000	.000
	Mean_SR	.000	.000	.000	.000	.000	.	.000
	Mean_SI	.000	.000	.000	.000	.000	.000	.
N	Motivation	294	294	294	294	294	294	294
	Mean_SV	294	294	294	294	294	294	294
	Mean_UC	294	294	294	294	294	294	294
	Mean_SC	294	294	294	294	294	294	294
	Mean_SFE	294	294	294	294	294	294	294
	Mean_SR	294	294	294	294	294	294	294
	Mean_SI	294	294	294	294	294	294	294

Variables Entered/Removed(b)

Model	Variables Entered	Variables Removed	Method
1	Mean_SI, Mean_UC, Mean_SC, Mean_SR, Mean_SV, Mean_SFE(a)	.	Enter

a All requested variables entered.
b Dependent Variable: Motivation

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.772(a)	.595	.587	10.704

a Predictors: (Constant), Mean_SI, Mean_UC, Mean_SC, Mean_SR, Mean_SV, Mean_SFE

ANOVA(b)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	48371.480	6	8061.913	70.368	.000(a)
	Residual	32880.847	287	114.567		
	Total	81252.327	293			

a Predictors: (Constant), Mean_SI, Mean_UC, Mean_SC, Mean_SR, Mean_SV, Mean_SFE
b Dependent Variable: Motivation

Coefficients(a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	88.062	8.828		9.976	.000					
	Mean_SV	-4.757	2.468	-.242	-1.927	.055	.312	-.113	-.072	.089	11.175
	Mean_UC	-3.679	2.753	-.120	-1.336	.183	.283	-.079	-.050	.174	5.736
	Mean_SC	-5.615	2.907	-.160	-1.932	.054	.273	-.113	-.073	.205	4.881
	Mean_SFE	6.535	2.189	.383	2.985	.003	.627	.174	.112	.086	11.678
	Mean_SR	6.533	1.504	.508	4.343	.000	.733	.248	.163	.103	9.701
	Mean_SI	4.745	2.193	.221	2.164	.031	.615	.127	.081	.135	7.416

a Dependent Variable: Motivation

Collinearity Diagnostics(a)

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions						
				(Constant)	Mean_SV	Mean_UC	Mean_SC	Mean_SFE	Mean_SR	Mean_SI
1	1	6.859	1.000	.00	.00	.00	.00	.00	.00	.00
	2	.098	8.383	.01	.00	.00	.00	.01	.06	.01
	3	.025	16.445	.06	.11	.00	.00	.01	.09	.00
	4	.009	27.960	.00	.00	.00	.00	.20	.04	.76
	5	.004	39.239	.00	.11	.14	.04	.62	.60	.13
	6	.003	45.268	.00	.12	.40	.35	.17	.20	.08
	7	.002	66.548	.92	.66	.46	.61	.01	.02	.03

a Dependent Variable: Motivation

Regression Statistics

Descriptive Statistics

	Mean	Std. Deviation	N
Attainment	4.77	1.755	294
Mean_SV	3.3204	.84695	294
Mean_UC	3.8107	.54392	294
Mean_SC	3.8798	.47532	294
Mean_SFE	3.3299	.97620	294
Mean_SR	3.3639	1.29474	294
Mean_SI	2.8308	.77653	294

Correlations

		Attainment	Mean_SV	Mean_UC	Mean_SC	Mean_SFE	Mean_SR	Mean_SI
Pearson Correlation	Attainment	1.00	.096	.052	.082	.337	.466	.324
	Mean_SV	.096	1.000	.907	.883	.816	.630	.776
	Mean_UC	.052	.907	1.000	.789	.757	.587	.728
	Mean_SC	.082	.883	.789	1.000	.751	.574	.733
	Mean_SFE	.337	.816	.757	.751	1.000	.900	.884
	Mean_SR	.466	.630	.587	.574	.900	1.000	.881
	Mean_SI	.324	.776	.728	.733	.884	.881	1.000
Sig. (1-tailed)	Motivation	.	.051	.186	.080	.000	.000	.000
	Mean_SV	.051	.	.000	.000	.000	.000	.000
	Mean_UC	.186	.000	.	.000	.000	.000	.000
	Mean_SC	.080	.000	.000	.	.000	.000	.000
	Mean_SFE	.000	.000	.000	.000	.	.000	.000
	Mean_SR	.000	.000	.000	.000	.000	.	.000
	Mean_SI	.000	.000	.000	.000	.000	.000	.
N	Motivation	294	294	294	294	294	294	294
	Mean_SV	294	294	294	294	294	294	294
	Mean_UC	294	294	294	294	294	294	294
	Mean_SC	294	294	294	294	294	294	294
	Mean_SFE	294	294	294	294	294	294	294
	Mean_SR	294	294	294	294	294	294	294
	Mean_SI	294	294	294	294	294	294	294

Variables Entered/Removed(b)

Model	Variables Entered	Variables Removed	Method
1	Mean_SI, Mean_UC, Mean_SC, Mean_SR, Mean_SV, Mean_SFE(a)	.	Enter

a All requested variables entered.
b Dependent Variable: Attainment

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.544(a)	.296	.281	1.489

a Predictors: (Constant), Mean_SI, Mean_UC, Mean_SC, Mean_SR, Mean_SV, Mean_SFE

ANOVA(b)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	266.808	6	44.468	20.067	.000(a)
	Residual	635.999	287	2.216		
	Total	902.806	293			

a Predictors: (Constant), Mean_SI, Mean_UC, Mean_SC, Mean_SR, Mean_SV, Mean_SFE
b Dependent Variable: Motivation

Coefficients(a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	6.155	1.228		5.014	.000					
	Mean_SV	-.064	.343	-.031	-.186	.852	.096	-.011	-.009	.089	11.175
	Mean_UC	-.828	.383	-.257	-2.163	.031	.052	-.127	-.107	.174	5.736
	Mean_SC	-.273	.404	-.074	-.676	.500	.082	-.040	-.033	.205	4.881
	Mean_SFE	.062	.304	.035	.204	.838	.337	.012	.010	.086	11.678
	Mean_SR	.939	.209	.693	4.489	.000	.466	.256	.222	.103	9.701
	Mean_SI	-.116	.305	-.051	-.380	.704	.324	-.022	-.019	.135	7.416

a Dependent Variable: Attainment

Collinearity Diagnostics(a)

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions						
				(Constant)	Mean_SV	Mean_UC	Mean_SC	Mean_SFE	Mean_SR	Mean_SI
1	1	6.859	1.000	.00	.00	.00	.00	.00	.00	.00
	2	.098	8.383	.01	.00	.00	.00	.01	.06	.01
	3	.025	16.445	.06	.11	.00	.00	.01	.09	.00
	4	.009	27.960	.00	.00	.00	.00	.20	.04	.76
	5	.004	39.239	.00	.11	.14	.04	.62	.60	.13
	6	.003	45.268	.00	.12	.40	.35	.17	.20	.08
	7	.002	66.548	.92	.66	.46	.61	.01	.02	.03

a Dependent Variable: Attainment

Descriptive Statistics – Low-Positive Perfectionist

	Mean	Std. Deviation	N
Motivation	93.29	16.423	105
Mean_SV	3.3314	.82267	105
Mean_UC	3.7746	.52602	105
Mean_SC	3.8921	.43973	105
Mean_SFE	3.2952	.93976	105
Mean_SR	3.3810	1.31105	105
Mean_SI	2.8559	.79717	105

Correlations

		Motivation	Mean_SV	Mean_UC	Mean_SC	Mean_SFE	Mean_SR	Mean_SI
Pearson Correlation	Motivation	1.000	.329	.339	.320	.693	.763	.671
	Mean_SV	.329	1.000	.879	.899	.779	.578	.737
	Mean_UC	.339	.879	1.000	.748	.717	.550	.683
	Mean_SC	.320	.899	.748	1.000	.750	.574	.748
	Mean_SFE	.693	.779	.717	.750	1.000	.900	.883
	Mean_SR	.763	.578	.550	.574	.900	1.000	.884
	Mean_SI	.671	.737	.683	.748	.883	.884	1.000
Sig. (1-tailed)	Motivation	.	.000	.000	.000	.000	.000	.000
	Mean_SV	.000	.	.000	.000	.000	.000	.000
	Mean_UC	.000	.000	.	.000	.000	.000	.000
	Mean_SC	.000	.000	.000	.	.000	.000	.000
	Mean_SFE	.000	.000	.000	.000	.	.000	.000
	Mean_SR	.000	.000	.000	.000	.000	.	.000
	Mean_SI	.000	.000	.000	.000	.000	.000	.
N	Motivation	105	105	105	105	105	105	105
	Mean_SV	105	105	105	105	105	105	105
	Mean_UC	105	105	105	105	105	105	105
	Mean_SC	105	105	105	105	105	105	105
	Mean_SFE	105	105	105	105	105	105	105
	Mean_SR	105	105	105	105	105	105	105
	Mean_SI	105	105	105	105	105	105	105

Variables Entered/Removed(b)

Model	Variables Entered	Variables Removed	Method
1	Mean_SI, Mean_UC, Mean_SC, Mean_SR, Mean_SV, Mean_SFE(a)	.	Enter

a All requested variables entered.
b Dependent Variable: Motivation

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.806(a)	.649	.627	10.024

a Predictors: (Constant), Mean_SI, Mean_UC, Mean_SC, Mean_SR, Mean_SV, Mean_SFE

ANOVA(b)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	18202.002	6	3033.667	30.191	.000(a)
	Residual	9847.427	98	100.484		
	Total	28049.429	104			

a Predictors: (Constant), Mean_SI, Mean_UC, Mean_SC, Mean_SR, Mean_SV, Mean_SFE
b Dependent Variable: Motivation

Coefficients(a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	85.309	16.670		5.117	.000					
	Mean_SV	-5.922	4.063	-.297	-1.458	.148	.329	-.146	-.087	.086	11.563
	Mean_UC	-.229	4.080	-.007	-.056	.955	.339	-.006	-.003	.210	4.768
	Mean_SC	-9.204	5.613	-.246	-1.640	.104	.320	-.163	-.098	.159	6.305
	Mean_SFE	10.396	3.518	.595	2.955	.004	.693	.286	.177	.088	11.313
	Mean_SR	3.193	2.399	.255	1.331	.186	.763	.133	.080	.098	10.242
	Mean_SI	6.772	3.440	.329	1.969	.052	.671	.195	.118	.128	7.783

a Dependent Variable: Motivation

Collinearity Diagnostics(a)

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions						
				(Constant)	Mean_SV	Mean_UC	Mean_SC	Mean_SFE	Mean_SR	Mean_SI
1	1	6.856	1.000	.00	.00	.00	.00	.00	.00	.00
	2	.101	8.256	.01	.00	.00	.00	.01	.05	.01
	3	.026	16.390	.04	.10	.00	.00	.00	.07	.00
	4	.009	27.698	.00	.00	.01	.00	.18	.05	.72
	5	.005	38.203	.01	.02	.32	.05	.46	.37	.04
	6	.004	43.947	.00	.22	.32	.10	.35	.44	.16
	7	.001	80.045	.94	.66	.36	.85	.00	.02	.08

a Dependent Variable: Motivation

Regression Statistics

Descriptive Statistics

	Mean	Std. Deviation	N
Attainment	4.86	1.893	105
Mean_SV	3.3314	.82267	105
Mean_UC	3.7746	.52602	105
Mean_SC	3.8921	.43973	105
Mean_SFE	3.2952	.93976	105
Mean_SR	3.3810	1.31105	105
Mean_SI	2.8559	.79717	105

Correlations

		Attainment	Mean_SV	Mean_UC	Mean_SC	Mean_SFE	Mean_SR	Mean_SI
Pearson Correlation	Attainment	1.000	.118	.077	.089	.366	.495	.394
	Mean_SV	.118	1.000	.879	.899	.779	.578	.737
	Mean_UC	.077	.879	1.000	.748	.717	.550	.683
	Mean_SC	.089	.899	.748	1.000	.750	.574	.748
	Mean_SFE	.366	.779	.717	.750	1.000	.900	.883
	Mean_SR	.495	.578	.550	.574	.900	1.000	.884
	Mean_SI	.394	.737	.683	.748	.883	.884	1.000
Sig. (1-tailed)	Motivation	.	.115	.218	.183	.000	.000	.000
	Mean_SV	.115	.	.000	.000	.000	.000	.000
	Mean_UC	.218	.000	.	.000	.000	.000	.000
	Mean_SC	.183	.000	.000	.	.000	.000	.000
	Mean_SFE	.000	.000	.000	.000	.	.000	.000
	Mean_SR	.000	.000	.000	.000	.000	.	.000
	Mean_SI	.000	.000	.000	.000	.000	.000	.
N	Motivation	105	105	105	105	105	105	105
	Mean_SV	105	105	105	105	105	105	105
	Mean_UC	105	105	105	105	105	105	105
	Mean_SC	105	105	105	105	105	105	105
	Mean_SFE	105	105	105	105	105	105	105
	Mean_SR	105	105	105	105	105	105	105
	Mean_SI	105	105	105	105	105	105	105

Variables Entered/Removed(b)

Model	Variables Entered	Variables Removed	Method
1	Mean_SI, Mean_UC, Mean_SC, Mean_SR, Mean_SV, Mean_SFE(a)	.	Enter

a All requested variables entered.
b Dependent Variable: Attainment

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.575(a)	.331	.290	1.595

a Predictors: (Constant), Mean_SI, Mean_UC, Mean_SC, Mean_SR, Mean_SV, Mean_SFE

ANOVA(b)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	123.466	6	20.578	8.086	.000(a)
	Residual	249.391	98	2.545		
	Total	372.857	104			

a Predictors: (Constant), Mean_SI, Mean_UC, Mean_SC, Mean_SR, Mean_SV, Mean_SFE
b Dependent Variable: Motivation

Coefficients(a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	9.857	2.653		3.716	.000					
	Mean_SV	.759	.647	.330	1.174	.243	.118	.118	.097	.086	11.563
	Mean_UC	-1.194	.649	-.332	-1.839	.069	.077	-.183	-.152	.210	4.768
	Mean_SC	-1.801	.893	-.418	-2.016	.046	.089	-.200	-.167	.159	6.305
	Mean_SFE	-.161	.560	-.080	-.288	.774	.366	-.029	-.024	.088	11.313
	Mean_SR	.833	.382	.577	2.181	.032	.495	.215	.180	.098	10.242
	Mean_SI	.597	.547	.251	1.091	.278	.394	.109	.090	.128	7.783

a Dependent Variable: Attainment

Collinearity Diagnostics(a)

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions						
				(Constant)	Mean_SV	Mean_UC	Mean_SC	Mean_SFE	Mean_SR	Mean_SI
1	1	6.856	1.000	.00	.00	.00	.00	.00	.00	.00
	2	.101	8.256	.01	.00	.00	.00	.01	.05	.01
	3	.026	16.390	.04	.10	.00	.00	.00	.07	.00
	4	.009	27.698	.00	.00	.01	.00	.18	.05	.72
	5	.005	38.203	.01	.02	.32	.05	.46	.37	.04
	6	.004	43.947	.00	.22	.32	.10	.35	.44	.16
	7	.001	80.045	.94	.66	.36	.85	.00	.02	.08

a Dependent Variable: Attainment

Descriptive Statistics – High-Positive Perfectionist

	Mean	Std. Deviation	N
Motivation	93.83	16.819	189
Mean_SV	3.3143	.86224	189
Mean_UC	3.8307	.55397	189
Mean_SC	3.8730	.49499	189
Mean_SFE	3.3492	.99780	189
Mean_SR	3.3545	1.28899	189
Mean_SI	2.8169	.76662	189

Correlations

		Motivation	Mean_SV	Mean_UC	Mean_SC	Mean_SFE	Mean_SR	Mean_SI
Pearson Correlation	Motivation	1.00	.303	.254	.251	.593	.717	.584
	Mean_SV	.303	1.000	.923	.876	.835	.658	.799
	Mean_UC	.254	.923	1.000	.811	.776	.608	.757
	Mean_SC	.251	.876	.811	1.000	.753	.575	.729
	Mean_SFE	.593	.835	.776	.753	1.000	.901	.888
	Mean_SR	.717	.658	.608	.575	.901	1.000	.880
	Mean_SI	.584	.799	.757	.729	.888	.880	1.000
Sig. (1-tailed)	Motivation	.	.000	.000	.000	.000	.000	.000
	Mean_SV	.000	.	.000	.000	.000	.000	.000
	Mean_UC	.000	.000	.	.000	.000	.000	.000
	Mean_SC	.000	.000	.000	.	.000	.000	.000
	Mean_SFE	.000	.000	.000	.000	.	.000	.000
	Mean_SR	.000	.000	.000	.000	.000	.	.000
	Mean_SI	.000	.000	.000	.000	.000	.000	.
N	Motivation	189	189	189	189	189	189	189
	Mean_SV	189	189	189	189	189	189	189
	Mean_UC	189	189	189	189	189	189	189
	Mean_SC	189	189	189	189	189	189	189
	Mean_SFE	189	189	189	189	189	189	189
	Mean_SR	189	189	189	189	189	189	189
	Mean_SI	189	189	189	189	189	189	189

Variables Entered/Removed(b)

Model	Variables Entered	Variables Removed	Method
1	Mean_SI, Mean_UC, Mean_SC, Mean_SR, Mean_SV, Mean_SFE(a)	.	Enter

a All requested variables entered.
b Dependent Variable: Motivation

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.761(a)	.579	.565	11.091

a Predictors: (Constant), Mean_SI, Mean_UC, Mean_SC, Mean_SR, Mean_SV, Mean_SFE

ANOVA(b)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	30794.355	6	5132.393	41.721	.000(a)
	Residual	22388.883	182	123.016		
	Total	53183.238	188			

a Predictors: (Constant), Mean_SI, Mean_UC, Mean_SC, Mean_SR, Mean_SV, Mean_SFE
b Dependent Variable: Motivation

Coefficients(a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	91.019	10.803		8.425	.000					
	Mean_SV	-3.677	3.255	-.189	-1.130	.260	.303	-.083	-.054	.083	12.035
	Mean_UC	-6.561	3.824	-.216	-1.716	.088	.254	-.126	-.083	.146	6.857
	Mean_SC	-3.578	3.479	-.105	-1.028	.305	.251	-.076	-.049	.221	4.533
	Mean_SFE	4.437	2.829	.263	1.569	.118	.593	.115	.075	.082	12.175
	Mean_SR	8.251	1.934	.632	4.266	.000	.717	.302	.205	.105	9.497
	Mean_SI	4.063	2.879	.185	1.412	.160	.584	.104	.068	.134	7.443

a Dependent Variable: Motivation

Collinearity Diagnostics(a)

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions						
				(Constant)	Mean_SV	Mean_UC	Mean_SC	Mean_SFE	Mean_SR	Mean_SI
1	1	6.861	1.000	.00	.00	.00	.00	.00	.00	.00
	2	.096	8.444	.02	.00	.00	.00	.01	.06	.00
	3	.025	16.555	.06	.10	.00	.00	.01	.11	.00
	4	.008	28.443	.00	.00	.00	.00	.20	.03	.77
	5	.004	39.622	.00	.16	.08	.03	.64	.65	.17
	6	.003	46.613	.04	.03	.28	.61	.15	.14	.03
	7	.002	64.635	.88	.71	.64	.35	.00	.01	.01

a Dependent Variable: Motivation

Regression Statistics

Descriptive Statistics

	Mean	Std. Deviation	N
Attainment	4.71	1.677	189
Mean_SV	3.3143	.86224	189
Mean_UC	3.8307	.55397	189
Mean_SC	3.8730	.49499	189
Mean_SFE	3.3492	.99780	189
Mean_SR	3.3545	1.28899	189
Mean_SI	2.8169	.76662	189

Correlations

		Attainment	Mean_SV	Mean_UC	Mean_SC	Mean_SFE	Mean_SR	Mean_SI
Pearson Correlation	Attainment	1.00	.082	.041	.078	.325	.449	.279
	Mean_SV	.082	1.000	.923	.876	.835	.658	.799
	Mean_UC	.041	.923	1.000	.811	.776	.608	.757
	Mean_SC	.078	.876	.811	1.000	.753	.575	.729
	Mean_SFE	.325	.835	.776	.753	1.000	.901	.888
	Mean_SR	.449	.658	.608	.575	.901	1.000	.880
	Mean_SI	.279	.799	.757	.729	.888	.880	1.000
Sig. (1-tailed)	Motivation	.	.130	.287	.144	.000	.000	.000
	Mean_SV	.130	.	.000	.000	.000	.000	.000
	Mean_UC	.287	.000	.	.000	.000	.000	.000
	Mean_SC	.144	.000	.000	.	.000	.000	.000
	Mean_SFE	.000	.000	.000	.000	.	.000	.000
	Mean_SR	.000	.000	.000	.000	.000	.	.000
	Mean_SI	.000	.000	.000	.000	.000	.000	.
N	Motivation	189	189	189	189	189	189	189
	Mean_SV	189	189	189	189	189	189	189
	Mean_UC	189	189	189	189	189	189	189
	Mean_SC	189	189	189	189	189	189	189
	Mean_SFE	189	189	189	189	189	189	189
	Mean_SR	189	189	189	189	189	189	189
	Mean_SI	189	189	189	189	189	189	189

Variables Entered/Removed(b)

Model	Variables Entered	Variables Removed	Method
1	Mean_SI, Mean_UC, Mean_SC, Mean_SR, Mean_SV, Mean_SFE(a)	.	Enter

a All requested variables entered.
b Dependent Variable: Attainment

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.546(a)	.298	.275	1.427

a Predictors: (Constant), Mean_SI, Mean_UC, Mean_SC, Mean_SR, Mean_SV, Mean_SFE

ANOVA(b)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	157.760	6	26.293	12.905	.000(a)
	Residual	370.812	182	2.037		
	Total	528.571	188			

a Predictors: (Constant), Mean_SI, Mean_UC, Mean_SC, Mean_SR, Mean_SV, Mean_SFE
b Dependent Variable: Motivation

Coefficients(a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	5.174	1.390		3.722	.000					
	Mean_SV	-.361	.419	-.185	-.861	.390	.082	-.064	-.053	.083	12.035
	Mean_UC	-.663	.492	-.219	-1.348	.179	.041	-.099	-.084	.146	6.857
	Mean_SC	.154	.448	.046	.345	.731	.078	.026	.021	.221	4.533
	Mean_SFE	.223	.364	.133	.612	.541	.325	.045	.038	.082	12.175
	Mean_SR	.976	.249	.750	3.921	.000	.449	.279	.243	.105	9.497
	Mean_SI	-.476	.370	-.218	-1.285	.200	.279	-.095	-.080	.134	7.443

a Dependent Variable: Attainment

Collinearity Diagnostics(a)

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions						
				(Constant)	Mean_SV	Mean_UC	Mean_SC	Mean_SFE	Mean_SR	Mean_SI
1	1	6.861	1.000	.00	.00	.00	.00	.00	.00	.00
	2	.096	8.444	.02	.00	.00	.00	.01	.06	.00
	3	.025	16.555	.06	.10	.00	.00	.01	.11	.00
	4	.008	28.443	.00	.00	.00	.00	.20	.03	.77
	5	.004	39.622	.00	.16	.08	.03	.64	.65	.17
	6	.003	46.613	.04	.03	.28	.61	.15	.14	.03
	7	.002	64.635	.88	.71	.64	.35	.00	.01	.01

a Dependent Variable: Attainment

APPENDIX E

PUBLICATION RECORD

[1] Osman, M.A., Zakaria. M.N., Loke, S.P. and Downe, A.G. (2012). *Secondary Students' Perfectionism and Their Response to Different Programming Learning Tools.* Paper presented at the 2012 IEEE Colloquium on Humanities, Science & Engineering Research (CHUSER 2012). 3-4 December, 2012.