Duke of Edinburgh International Award Accomplishment and Academic Achievement: A Two Year Study in a Malaysian International School

Brandon Yeo$^{1,1}$ and Chee Hui Yap$^2$

$^1$University College Fairview
$^2$Affiliation not available

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Abstract

The Duke of Edinburgh’s International Award is a non-formal outdoor education and learning framework that is mentioned frequently and widely in publications, however, little or no literature have compared the impact of DoE completion to students’ academic accomplishment. This study looks at the hours of contribution in the DoE program and individual participants studying in Fairview International School in a two-year time frame and its relationship with their academic achievement on the exit exam. Spearman correlation indicates the hours contributed by the students in the Service section of the DoE could be correlated to their academic accomplishment in English and Business Subjects. Clustering Analysis also indicates that students that contribute similar hours in their DoE also tend to perform similarly in their IGCSE results. Thus, we speculated that DoE could be good intermediary training for the student’s executive functions, and the peer network created pursuing the DoE process also allows them to gain useful social capital that allows them to succeed academically.
executive functions, and the peer network created pursuing the DofE process also allows them to gain useful social capital which in turn allows them to succeed academically.

Keywords: word; Outdoor Education Program, Academic Accomplishment, International Baccalaureate, Middle Year Program, International School Malaysia

List of Symbols and Abbreviations

IB: International Baccalaureate; MYP: Middle Years Programme; DofE: The Duke of Edinburgh’s International Award

Introduction

Duke of Edinburgh’s International Award

The Duke of Edinburgh’s International Award (DoFE) is a non-formal education and learning framework that was originally founded in 1956. Initially, it only involved a small group of national voluntary youth organisations but has quickly reached widespread popularity. Currently, it is operating in 130 countries celebrating young people’s achievements outside of academia. This framework believes in “each young person should be encouraged to examine themselves, their interests, abilities, and ambitions, then set their challenges in the four different sections of the Award” (DoFE, 2012b, p.12). A great summary breaking down the framework core belief and background of this program can be found in the article published by Eva van Baren et al (2015).

The Duke of Edinburgh’s International Award is mentioned frequently and widely in publications. A web search on Google Scholar on 09th May 2021 yielded 39,500 scholarly articles that contain the phrase “Duke of Edinburgh’s International Award”. Specific studies that explore the learning effects of the Award have reported that learning was found to be particularly enhanced through the “Adventure Journey” component of the Award (Bailey, 2003). MacMahon and O’Reilly (2015) also reported that DoFE provide substantial support and opportunities for the growth and mental well-being that are afforded to young people during the critical period of adolescence, which helps them to build their psychological attributes and positive personal strengths: i.e., self-efficacy, hope, happiness, self-esteem, and psychological well-being.

Impact of DofE on the Participant’s Self Development

The investigation of Cole, et al (2016) have found that the learning attribution of the Award is an intermediary. Using the ROPELOC survey framework, they have found that the award is most able to enhanced the “Self Confidence” aspect of the participants among the all eleven aspects. The levels of how they ranked are as follows: (1) Self-Confidence, 2) Cope with Change, 3) Leadership Ability, 4) Overall Effectiveness, 5) Active Involvement 6) Time Efficiency, 7) Self-Efficacy, 8) Social Effectiveness, 9) Cooperative Teamwork, 10) Stress Management, and, 11) External Locus of Control).

The adventurous and expeditions section of the DoFE programs has also been found to enhance the personal and social development for young people (e.g., Ewert, 1983; Gibbs, & Bunyan, 1997, Grey, 1984; Kennedy, 1994; Allison, 1998; Beames, 2003, 2004, 2005). Besides, the development of leadership skills, self-confidence and ability to take initiative also been observed in a study done by Smith and Isles (2004). The Effects of adventure program have also been reported to exceed those of other educational programs (Hattie, et al., 1997), possibility due to the deep appreciation of the learning experience by the participants (Fleming 2003) and Sleight 2005).
Extracurricular Activities on Student’s Academic Accomplishment

Many factors can affect the child academic performance. Social, Economic and Parental influence, as well as how the child chose to spend their free time outside of the traditional in class instruction settings have all been described to have significant impact towards their academic achievement. Specifically, a study by the US Department of education have reported that “students who participate in co-curricular activities are three times more likely to have a grade point average of 3.0 or better” than students who do not participate in co-curricular activities (Stephens & Schaben, 2002, para. 4).

A study by Guest and Schneider (2003) reported three main factors on how outdoor activities could that have influenced academic results. The factors are the “what,” the “where,” and the “when” (Guest & Schneider, 2003, para. 7). The “what” suggested that “the type of participation or activity undertaken influences developmental outcomes” (Guest & Schneider, 2003, para. 8). The “where” suggests “that the school and community context in which extracurricular activity takes place matters” (Guest & Schneider, 2003, para. 9). Finally, the “when” suggests “that the developmental and historical context in which extracurricular participation takes place influences both how it is valued and its effects on subsequent development” (Guest & Schneider, 2003, para. 10). These factors work together synergistically by allowing the child to understand the different value of activities and academics and improve their participations in the academic settings.

Research Questions

This study looks at the hours of contribution in the DofE program by individual participants studying in Fairview International School on a two-year time frame and its relationship with their academic achievement on the exit exam. This is to explore the relationship between extracurricular activities and academic achievement in an international school in Malaysia.

The result of this study hopes to support the managing body of the school to understand the effect of an additional programme, the Duke of Edinburgh International Award on its students. The Award is lauded as highly beneficial to young adults, and it’s implemented in many IB schools worldwide but there is little to no study on it. As testimonials may be subjected to selection bias, a statistical study provides an objective view on the matter. With this study, the school managing body can better optimise its strategy in the planning of extra-curricular activities while also reaping the benefit of the extra-curricular activities for academic achievement.

Methodology

Participant’s Background

This study was conducted at Fairview International School Malaysia. The participants were a subset of students from a network of five schools located in (Kuala Lumpur, Penang, Johor, Subang and Ipoh states). Due to the voluntary basis, this data only consists of participants that were active in the program, and have agreed to be part of this study and thus do not represent the actual performance of the school. The details of participants can be found in Supplementary Document 1 attached. The campus detail from participants was removed to prevent data from being traceable to individuals.

Two batches of participants were included. Both batches of participants took part in the DofE programs during the final year of their MYP program, where they also took an IGCSE exit exam by the end of the academic year. The first batch (n= 134) graduated in the year 2019 and the second batch (n=125) graduated in the year 2020. The participants come from a wide range of backgrounds and ethnicities but were not included in the analysis of this study due to privacy concerns.
Data Collection

The academic achievement of the participants was summarised by their accomplishment in the IGCSE exit exam from the Cambridge Assessment Bodies. Specifically, this study focuses on four subjects where every participant must undertake, i.e. (Mathematics, Science, English, and Business).

The DofE accomplishment and completion status were collected using the self-reporting booklet issued by the DofE bodies. Within the DofE Award Record Booklet, the hours spent into each of the activities were extracted and summarized. The final status of the completion of the program is also collected and verified with the DofE Bodies. This study focuses on the “Service”, “Skill” and “Physical” aspect of the DofE program as the Adventure section is covered by a mandatory school expedition program and all participants reported the same level of accomplishment in that section.

Data Analysis

This study employed a horizontal cross-section analysis towards the relationship between the two variables over the two batches of participants. Longitudinal analysis of the participants’ performance over the two years might provide a better understanding of progression, but it was not conducted in this study due to the fear of lack of external standardization and anchoring of the academic accomplishment in the internal examination and thus limiting the external validity of this study.

All data was collected and summarised using Google Sheets and transferred to RStudio for all statistical analysis. The general trend and distribution of the student’s DofE status, as well as their IGCSE results and further analysis, are described are below. All data visualization below was constructed with the “ggplot2” packages unless stated otherwise.

Regression Analysis

The raw hours committed by individual participants in the DofE program and their academic achievement in the IGCSE was analysed using the “PerformanceAnalysis” Package in the R environment. This includes the linear regression and spearman’s correlation analysis to examine the causal relationship between all seven variables included in this study.

Clustering Analysis

To examine if participants have behaviour similar in the two programs, clustering analysis was conducted on the dataset. Two types of clustering were used to visualize the hyperdimensional clustering of the dataset. Namely, Principal component analysis (PCA) and t-distributed stochastic neighbour embedding (t-SNE).

PCA is one of the gold standards used for dimensionality reduction and model making, however, it is often only able to capture models with direct linear relationships between the variables and often unable to properly cluster data that does have obvious patterns. In recent years, t-SNE has been proven to be useful due incredible flexibility, it can often find structure when other dimensionality-reduction algorithms fail (Wattenberg, M, et al 2016).

Ethical Concerns

The participants participated in this study voluntarily. All participating participants were given an informational letter about the study as well consent forms which are signed by them and their parent’s prior before taking part in this study. The informational letter contains the research intention and the researcher's identity, and also inform the participants on the type of information, including which personal information will be collected through the survey and information that would be published. The participating participants reserved the rights to withdraw from this study at any time.
Results

Due to the difference in participants' demographics, backgrounds and changes in the exam syllabus. We have decided not to pool two batches of participants into a single group, but rather, treated each as independent sample groups for this investigation.

General Trends and Distribution

Batch 1

Figure 1 presented a schematic overview of the student’s accomplishments in the DoE program. Among the 134 participants, 60% were male while 40% were female. The overall completion rate of the program is 90.4%. The overall hour’s committed shows strong kurtosis with the majority of the participants within the 90 to 110 hours range. Similar trends can be observed in hours committed in the physical section. Meanwhile, hours committed towards service shows a fairly standard distribution while hours committed through skills shows a strong left skew. The IGCSE results also showed a strong skew towards the right. In all four subjects (English, Science, Business, Mathematics), more than 46% of all participants have achieved a score of “A” in their examination. This is especially prominent in business subjects, where a total of 57% of all participants have achieved an “A” in their examination.

Batch 2

Figure 2 presents a schematic overview of student’s accomplishments in the DoE program. This batch of participants (n=125) was made up of 40% male and 60% female and accomplished a similar completion rate at 90.4%. Batch 2 showed much weaker performance in their academic results. In English, around 20% have gotten a B, C and D, with only 10% have gotten an A in this subject. In Science, around 20% have gotten an A, B, or C, and 15% on E and around 10% for the rest. The business subject has continued to be the best subjects among the four, but the participants that have gotten an A have dropped to 35%, with 20% for B and C respectively. Lastly, the Mathematics subject has shown a similar trend to the Science subject (batch 2), with only 10% of participants in A and around 20% of participants in B and C, respectively.

Correlation and Clustering Analysis

Batch 1

Assuming a nonlinear relationship between the different factors, a Spearman correlation analysis is conducted on all the seven factors in this study. From batch 1 participants, we can observe a negatively skew data in the “Skills” and “Physical” section, but the “Service” aspect section of the DoE program data appear to be symmetric distributed with no skew. The academic accomplishments displayed a general right skewness in all the data. We have also seen a significant correlation between the English score and hours contributed in the Service section (alpha=0.28). We can also observe similar correlations between the English/Business score and the hours contributed in the Skills Section (alpha=0.25/0.26).

PCA plot on four subjects does not display any significant cluster on the dataset. This is to be expected as the data are no linearly correlated and human-centric data such as academic accomplishment in a small component from this study between sample groups does not usually allow for the clean clustering analysis of the sample groups. Thus, we employed an t-SNE clustering approach in this exploratory analysis.

The t-SNE plot displayed a distinct cluster on the top right corner of the scatter plot. However, this group seems to correlate with a lower academic accomplishment and lower hours of contribution as observed in the English and Business plot, where the relationship between these two subjects and DoFE contributions seems to be correlated.
Batch 2

Similar trends can be observed in the results from batch 2, but there are a few key differences. DofE contributions seem to be all left-skewed, while all the subjects are right-skewed. We also observed a stronger correlation between the academic accomplishment of the participants. From the correlation analysis, we can see a correlation between the Service contribution and their academic accomplishment in the English, Business and Mathematics subjects (alpha=0.30, 0.23 and 0.29).

Unlike Batch 1, PCA analysis shows a cluster of high academic achievers on the bottom right of the plot. These groups seem to consist of participants that score high in all four subjects. We also observed a similar, but less separated group in the top mid-right of the plot. Meanwhile, t-SNE shows similar results as in PCA analysis. We can see the same high academic achievers cluster on the left side of the group and another cluster on the top. These two clusters seem to contain a lower number of participants with a high score in the English subject, but this could be due to the lower percentage of participant that scores an A or A* in the English subject.

Discussion

Executive Function

The DofE program is a year-long program that was purposely designed to prevent an intensive period of contribution but force participants to have a minimum contribution over a longer period. With that, we speculate that the DofE program allows for the training of their Executive Function (EF), especially, the thoughtful planning of their future action that allows them to better prepare for their major assessment.

Based on the definition by Shonkoff & Phillips (2000), executive function (EF) is a wide collection of neuropsychological processes that are responsible for “thought, behaviour, and emotion that allow for adaptation to fluctuating environmental demands”. One of the key features we want to focus on here is the ‘thoughtful planning of future actions in one’s executive functions (Willoughby, Blair, Wirth, & Greenberg, 2010; Zelazo & Carlson, 2012). EF allows for one’s to create new ways of behaviour learning, and optimise one’s actions in unfamiliar situations.

Despite that, most studies (e.g., Altemeier, Jones, Abbott, & Berninger, 2006; Gathercole & Pickering, 2000; St Clair-Thompson & Gathercole, 2006; Stipek & Valentino, 2015; van der Sluis, de Jong, & van der Leij, 2007) in the past have only focus on relatively short intervals of time for such effects and longitudinal studies that examine long term effects of complex EF skills are rare. It is hoped that this study could allow for future studies to build more establishment between EF and academic achievement and its possible connection between the DofE programs.

Theories of social capital

DofE encourages a holistic and multidisciplinary learning environment for the student, this allows the students to mix with peers outside of a traditional classroom. The three aspects of the DofE awards, namely Skills, Service and Physical encourage students to go out of their way to meet new people from the process of learning a new skill (e.g Learning of taekwondo, going to instrumental class and participating in bands/orchestra), participating in a new competition or training), or service which involved in them participating in community service and meet people around the neighbourhood. It is possible that the participants, through the DofE program, have built up their social capital through the multiple networks they are involved in.

The core idea of the social capital theory is the potential benefits one can get from the ‘productivity of individuals and groups’ (Putnam 2000, p. 19). First formalised by Bourdieu (1986) and Coleman (1988), they addressed how one can gain cultural and economic benefits as members of families, social groups and
institutions. Thus, social capital is acquired by an individual’s investment, in various amounts and forms, in their particular social relationships, and can be subsequently translated into economic and cultural benefits.

One of the forms such capital can be gained is through outdoor settings. Past research in North America (Mitten, 1999; Priest & Gass, 1997), Australia (Quay, Nettleton, & Dickinson, 2000) and the United Kingdom (Gair, 1997; Mortlock, 1984) have also reported that outdoor education has allowed for the development of outdoor education communities; i.e., a smaller and internally-oriented groups in the centre of residential centres. This allows for many community-building opportunities and could allow for more programme that build positive human relationships between social groups (Lugg, 2001; Mitten, 1999; Quay, Dickinson, & Nettleton, 2000).

With that, we believe that the integration of DoE programs as experiential education programmes could allow for building the students social capitals by providing them opportunities to connect and embedded themselves into their home communities. This could be done physically in the place they live, or on the virtual space (online communities) where they could interact with people of the same interest.

Conclusions

This study presents a preliminary insight into any potential impact of implementing the DoE Bronze program into an international high school in Kuala Lumpur, Malaysia. Over the two consecutive years, we did not find any negative impact towards their studies but a slight positive correlation between the hours contributed in the DoE Service aspect and their English language results, and in the second year, a positive relationship between the service aspect of DoE to the English and Mathematics results. We also propose the completion of DoE awards and their possible contribution to the general executive function and social capital of the participants. We hope that the result of this study will help the managing body of the school to understand the effect of an additional programme, the Duke of Edinburgh International Award, on its students. With this study, the school managing body can better optimise its strategy in the planning of extra-curricular activities while also reaping the benefit of the extra-curricular activities for academic achievement.

List of References


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Table 1 A summary of requirements for different levels in the Duke of Edinburgh’s International Award, adapted from Eva van Baren et al (2015).

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<th>BRONZE</th>
<th>SILVER</th>
<th>GOLD</th>
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<tr>
<td>Minimum Age</td>
<td>14</td>
<td>15</td>
<td>16</td>
</tr>
<tr>
<td>Minimum Participation Period*</td>
<td>6 months</td>
<td>6 months or 12 months*</td>
<td>12 months or 24 months*</td>
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<tr>
<td>Service</td>
<td>3 months (18 hours)</td>
<td>6 months (36 hours)</td>
<td>12 months (60 hours)</td>
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<tr>
<td>Physical Fitness</td>
<td>3 months (18 hours)</td>
<td>6 months (36 hours)</td>
<td>12 months (60 hours)</td>
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<tr>
<td>Skills</td>
<td>3 months (18 hours)</td>
<td>6 months (36 hours)</td>
<td>12 months (60 hours)</td>
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<tr>
<td>Adventurous Journey</td>
<td>2 days / 1 night</td>
<td>3 days / 2 nights</td>
<td>4 days / 3 nights</td>
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<td>Residential Project</td>
<td>3 days / 2 nights</td>
<td>4 days / 3 nights</td>
<td>5 days / 4 nights</td>
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* Minimum time depends on whether participant holds a previous Award

Figure 1 Overall distribution statistics of IGCSE accomplishment by batch 1 participants (n=134).
Figure 2 Overall Distribution statistics of IGCSE accomplishment on batch 2 (n=125)

Figure 3 Correlation between Academic data and DoFE on batch 1 participants (n=134). Values in the top right displayed the Spearman Correlation coefficient with an asterisk indicating the significances of the comparison ("*" alpha<0.05, "**" alpha< 0.01, "***", alpha<0)
Figure 4 Principal component analysis (PCA) plot on batch 1 student’s (n=134) DoFE’s accomplishment using the first two principal components. Each dot represents a single student and is colour coded to represent their academic accomplishment in IGCSE (Red= High (A, A+); Blue = Mid (B, C); green = Low (D and Below)).

Figure 5 t-distributed stochastic neighbour embedding (t-SNE) analysis on batch 1 student’s (n=134) DoFE’s accomplishment. Each dot represents a single student and is colour coded to represent their academic accomplishment in IGCSE (Red= High (A,A+); Blue = Mid (B,C); green = Low (D and Below))
Figure 6 Overview of spearman correlation of batch 2 participants (n=125) between academic data from four subjects and three aspects in the DoFE program. Values in the top right displayed the Spearman Correlation coefficient with an asterisk indicating the significances of the comparison ("*" alpha<0.05, "**" alpha<0.01, "***" alpha<0.001). The middle represented the distribution of hours logged in the respective aspect in histograms. The bottom left displayed the bivariate scatter plot of the two aspects.

Figure 7 Principle component analysis on batch 2 student’s (n=125) DoFE’s accomplishment using the first two principal components. Each dot represents a single student and is colour coded to present their academic accomplishment in IGCSE (Red= High (A, A+); Blue = Mid (B, C); green = Low (D and Below).
Figure 8 t-distributed stochastic neighbour embedding (t-SNE) analysis on batch 2 student’s (n=125) DoFE’s accomplishment. Each dot represents a single student and is colour coded to present their academic accomplishment in IGCSE (Red = High (A, A+); Blue = Mid (B, C); green = Low (D and Below).

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