Brief Communication

Neuroscience Club in SKKK3 and SMSTMFP: The Brain Apprentice Project

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Abstract

Sekolah Menengah Sains Tengku Muhammad Faris Petra (SMSTMFP) and Sekolah Kebangsaan Kubang Kerian (3) (SKKK3) were selected by the Department of Neurosciences, Universiti Sains Malaysia (USM), in 2011 to be a 'school-based Neuroscience Club' via the 'Knowledge Transfer Programme (KTP) – Community' project. This community project was known as "The Brain Apprentice Project". The objectives of this project were to promote science and the neurosciences beyond conventional classroom teachings whilst guiding creativity and innovation as well as to assist in the delivery of neuroscience knowledge through graduate interns as part of the cultivation of neuroscience as a fruitful future career option. All of the planned club activities moulded the students to be knowledgeable individuals with admirable leadership skills, which will help the schools produce more scientists, technocrats and professionals who can fulfil the requirements of our religion, race and nation in the future. Some of the activities carried out over the years include the "My Brain Invention Competition", "Mini Brain Bee Contest", "Recycled Melody" and "Brain Dissection". These activities educated the students well and improved their confidence levels in their communication and soft skills. The participation of the students in international-level competition, such as the "International Brain Bee", was one of the ways future professionals were created for the nation. The implementation of Neuroscience Club as one of the organisations in the school's co-curriculum was an appropriate step in transferring science and neuroscience knowledge and skills from a higher education institution, namely USM, to both of the schools, SMSTMFP and SKKK3. The club members showed great interest in all of the club's activities and their performance on the *Ujian Pencapaian Sekolah Rendah* (UPSR) or Primary School Achievement Test and *Sijil Pelajaran Malaysia* (SPM) or Malaysian Certificate of Education examinations improved tremendously.

Keywords: *neurosciences, knowledge, creativity, society*

Introduction

The Department of Neurosciences, Universiti Sains Malaysia (USM) has introduced "The Brain Apprentice" (TBA), which involves three entities: expertise from the Department of Neurosciences - Professor Dato' Dr. Jafri Malin Abdullah, Associate Professor Dr. Muzaimi Mustapha and Dr. Nasir Mohd Yusoff; graduate interns; and two school-based Neuroscience Clubs: Sekolah Menengah Sains Tengku Muhammad Faris Petra (SMSTMFP) and Sekolah Kebangsaan Kubang Kerian (3) (SKKK3). SMSTMFP was established in 1973 and has had great achievements in many aspects, which glorified the name of the school as the 'national top residential school' and 'national high-performing school'. The SMSTMFP Neuroscience Club had a membership of 42 students. The club consisted of students from Form 1 to Form 5 and 2 responsible staff teachers, whilst the SKKK3 Neuroscience Club had a membership of 80 students and was composed of students from Year 4 to Year 6 and 4 responsible staff teachers.

The life and natural sciences field has been considered one of the toughest subjects for most students, causing them to have limited interest in science subjects and to consider the prospect of becoming a scientist an unglamorous career, even though neuroscience has become "the last frontier of human knowledge". This may cause a significant shortage of scientists and technology experts in our country, which would hinder the achievement of Malaysia's target to become a developed nation by 2020, with an emphasis on developing a knowledge-based economy. Therefore, we need to find a way to make transformations to achieve the 10th Malaysia Plan. These transformations of

science, mathematics and technology education in schools are of the utmost importance.

The objectives of setting up Neuroscience Club in schools were:

1. To invest in young students to promote science and the neurosciences beyond conventional classroom teachings whilst guiding creativity and innovation;

2. To assist in the delivery of neuroscience knowledge via graduate interns as disseminators, making science a fruitful future career option.

Literature Review

The simplest definition of neuroscience is the scientific study of the nervous system (1) or a multidisciplinary science concerned with the study of the structure and function of the nervous system (2).

Knowledge transfer is a term used to encompass a broad range of activities that support mutually beneficial collaborations between universities and the public sector. In addition, knowledge transfer can be a way to gain new perspectives on possible directions and approaches for research (3).

Methodology

"University in the Garden" emphasises a greener earth and sustainability, while "Research University" emphasises training, research and development in various fields, in this case neuroscience. This knowledge transfer project was between the Department of Neurosciences, School of Medical Sciences, USM and two schools: SMSTMFP and SKKK3. The Department of Neurosciences comprises expertise from locals and foreigners, in either service or research. This expertise in basic and clinical neuroscience offers an opportunity for students to pursue future postgraduate training. Thus, one of the reasons for TBA was to create an engaging, proactive community between the university and the schools to promote medical, basic science and neurosciences research so that the school's students would have more ideas and their interest in these fields would gradually increase.

There were two phases involved in this knowledge transfer program. First, at the school level, the respective schools' Neuroscience Club received scientific exposure beyond the confines of their typical classroom syllabus, with a culture of eco-friendly innovation and unique learning reinforcements for the neurosciences. Second, at the university level, graduate interns were trained with a basic neuroscience foundation as a starting point to empower and train them for wider community engagement.

Phase 1 of the TBA involved passive intern involvement, which entailed school-led activities. This phase only involved the teachers and students of the Neuroscience Club. The teachers and students carried out the neuroscience-related activities, such as neuroscience quizzes, poster drawing and a science storytelling competition. All of the planned activities involved the propagation of future state and/or nationwide school-based Neuroscience Club, whereas phase 2 entailed active intern involvement with USM-led neuroscience activities. This phase involved graduate interns, and there were three components of expert-led neuroscience-related activities: the "My Brain Invention Competition", "International Brain Bee Championship" and "Recycled Melody". Both phases were completed within 12 months.

Results and Discussion

At the end of the 12-month period, we found that the graduate interns had been well-trained in a basic neuroscience foundation as a starting point to empower and train them for wider community engagement. The respective schools' Neuroscience Club had also received scientific exposure beyond the confines of their typical classroom syllabus, with a culture of eco-friendly innovation and unique learning reinforcement for neuroscience.

In addition, based on observations of the teachers and supervisor of the clubs, we observed some improvements in the confidence level of the students and in their soft skills. Their confidence could not only be observed through the way they communicated but also through their presentations during club activities and in the classroom during the teaching and learning process.

In addition, some activities that involved higher-order critical thinking were established at SMSTMFP, which contributed to the way they made decisions. Examples of these activities included competitions to design the Neuroscience Club logo and motto, which had a theme of 'Neuroscience beyond the extraordinary'; the observation of brain cells on slides using a microscope; linking daily events with brain functions; conducting brain surgery on a goat's brain; and performing wet curing. From these

types of activities, we could see that the students really enjoyed the activities and that these activities indirectly trained them to work in groups, the names of which were based on cells in the nervous system, such as 'Glial', 'Oligodendrocytes', 'Neurons', 'Interneuron', 'Astrocytes', 'Purkinje' and 'Schwann'. Aside from these activities, the participation of the students in international competition, namely the "International Brain Bee", was also a step in training the students to be better candidates for future scientists or medical experts for the nation.

Furthermore, we also observed significant improvement through their academic results, especially in the public examination results, specifically science in *Ujian Pencapaian Sekolah Rendah* (UPSR) or Primary School Achievement Test for the primary school (SKKK3) and biology in *Sijil Pelajaran Malaysia* (SPM) or Malaysian Certificate of Education for the secondary school (SMSTMFP). As a result of this great impact, the ranking of the school under the National Key Result Area (NKRA) ranking system has shown continuous improvement.

Because the Neuroscience Club at SKKK3 was introduced in 2011, the percentage of 'A's and passing grades in the sciences gradually increased from 2011 until 2013. The number of 'A's and the Subject Average Grade (GPS) were 109 and 1.67, respectively, in 2011. In 2012, the number of 'A's and the GPS were 102 and 1.62, respectively, while in 2013; the number of 'A's was 101 and the GPS was 1.63. These results are shown in Table 1. In addition, there were also achievements in school rankings; the GPS gradually decreased from 2010 (GPS: 1.65) to 2013 (GPS: 1.43). The decreasing of the GPS indicates higher achievement. Based on the NKRA rankings, SKKK3 was positioned 150th among the schools from 2009 to 2010. However, its ranking improved after 2010. In 2011, SKKK3 was positioned at 130 of 7674, and in 2012 and 2013, SKKK3 was in the top 100; 50 of 7696 in 2012 and 33 of 7695 in 2013. The school ranking results are shown in Table 2.

Like SKKK3, the Neuroscience Club was introduced to SMSTMFP in 2011. The results for both SPM trial and SPM gradually increased. Each year from 2011 to 2013, improvements were observed. For example, in 2012 and 2013, there were 3 students in total who achieved 10 As, compared to either SPM trial in 2012 and 2013 or SPM in 2011, in which no student achieved 10 As. The number of students who achieved 9 As also increased, from 4 students in 2012 to 7 students in 2013. The achievement results for the Neuroscience Club members are shown in Table 3.

The results of the current examinations also showed improvement; 2 students achieved 10 As on the final examination compared to only a single student who achieved 10 As on the midterm examination. Furthermore, the number of students who achieved 2 As decreased from 1 at the midterm examination to zero, as no one achieved 2 As on the final examination. The results of the current examinations are summarised as shown in Table 4.

Conclusion

TBA programme has produced many positive impacts on the schools, especially on the students. It has successfully fulfilled almost all of the outlined objectives of the programme. Throughout these activities, numerous improvements in achievement were demonstrated, in either the co-curriculum or academic sectors. The transfer of knowledge between these communities in a friendly and very comprehensive manner was also demonstrated. Thus, based on the results of this collaboration, we are strongly recommending and proposing that this programme be extended to other schools, not only in Kelantan but also to other states.

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Table 1: UPSR Science Analysis (SKKK3)

Year	Number of 'A'	Percentage of 'A'	Percentage of passes	GPS
2010	116	44.57	96.2	1.68
2011	109	42.18	98.7	1.67
2012	102	43.40	99.6	1.62
2013	101	46.54	100.0	1.63

Table 2: School Ranking (SKKK3)

Year	GPS	NKRA ranking	School band
2009	1.65	222/7617	2
2010	1.65	152/7697	1
2011	1.56	130/7674	1
2012	1.44	50/7696	1
2013	1.43	33/7695	1

Table 3: SPM result of member of Neuroscience Club (SMSTMFP)

Year	SPM Trial								SPM							
	10A	9A	8A	7A	6A	5A	4A	3A	10A	9A	8A	7A	6A	5A	4A	3A
2011	0	1	0	0	2	3	1	2	0	1	2	0	0	3	3	0
2012	0	1	2	5	2	8	1	0	1	4	5	3	4	2	0	0
2013	0	1	2	5	7	4	0	1	2	7	3	3	3	1	1	0

Table 4: Current examinations result of Neuroscience Club's member, 2014 (SMSTMFP)

Number of 'A'	Midterm examination	Final examination
10A	1	2
9A	3	1
8A	0	0
7A	2	1
6A	2	2
5A	1	4
4A	0	0
3A	1	1
2A	1	0
1A	0	0

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Conflict of Interest

None.

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Authors Contribution

All authors were involved in the draft and editing of manuscript.

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