原著

Learning motivations: Consistency of a desired plan for paramedical students

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Abstract: Many factors influence academic performance. This study explores the sources of motivation for paramedical students who want to become a medical engineer and the related factors that improve their learning motivation. A questionnaire was administered to Department of Medical Engineering students. One hundred eighty-six students participated in the survey. The questionnaire evaluated six areas: application period（i.e., time taken between deciding to apply and entrance examination）; opportunity for course selection; future vision; coincidence between the desired plan and the actual course; intention to acquire qualifications; and learning time. The results showed that whether the desired plan and actual course match influences the students' academic performance and future vision. An important factor for medical technology students to develop learning motivation is that they should establish a firm determination about their future career before admission, which influences their academic performance.

Key words: *motivation, academic performance, medical technology, paramedical course*

1. Introduction

Universities offering paramedical courses are expected to help their students to obtain professional qualifications. While the students and their guardians' demand for the acquisition of qualifications remains high, the need for teachers to motivate their students to maintain a sustained effort toward improving their academic grades is often recognized as being difficult. The students' educational attainment prior to admission is clearly an influential factor for their academic grade. However, the students' academic performance can be influenced by many other factors, such as the learners' environment, motivation for learning, mental stability, and financial difficulties[1–3]. Previous studies have reported the issue of social origins; i.e., differences in access to professions are more complex than differences in prior academic attainment alone[4,5] . Another study reported medical school students' motivational factors by measuring the strength of their motivation and found that there no differences in motivation strength according to sex, nationality, or age[6] . The students' ability to achieve success in school is strongly influenced by their ability to put in the time and effort to dedicate themselves to study and learn[7] . Babenko *et al*. reported that the pursuit of dedicated personal activities, such as sports, appears to be associated with the desired motivation qualities for learning in medical students[8] . In a study exploring academic motivation, Kuniyoshi found that university students' motivation for learning was largely influenced by practical and profitable aspects, and these students largely intended to obtain a qualification[9–10]. A similar tendency was seen in a study of university students from a teacher training course[11]. However, few educational studies of learning motivation in paramedical university students have been performed.

It is obvious that students taking a paramedical course at university have a more practical purpose for obtaining their professional qualifications. However, we feel that students need to not only have a purpose, but also a strength of sense of purpose to improve their academic performance. Therefore, this study focused on the students' sources of motivation, which lead to their strength of sense of purpose. A questionnaire survey for paramedical university students was administered to explore their sources of motivation with the aim to identify the factors connected to the

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Table 1. Questionnaire item contents

1. How long was the length of time from when you decided on your future plans up until the actual entrance examination? <Application period>
□< 1m □1 to <3m □3 to <6m □6 to <1y
□1y □2y □>3y
2. What was the opportunity for your course selection? <Opportunity for course selection>
□My own intention <own intention>
□Advice from family or relatives <family recommendation>
□Advice from senior school teacher(s) <teacher recommendation>
□Advice from friends or school seniors <advice from friends>
□Workplace experience carried out as a part of a school lesson <workplace experiences>
□Participating in an open campus at university <open campus>
□Others
3. What is your future vision? <Future vision>
□A trusted medical engineer with acquired medical skills <techniques>
□Working as a medical researcher <research activities>
□Educator
□Emphasis on personal time while working a job to pay for living expenses <own time>
□Studying for another purpose <another purpose>
□Household
□Others
4. Was your desired plan before enrollment consistent with the actual course you took? <Course coincidence>
□Yes □No
5. Do you intend to acquire medical engineering-related qualifications? <Acquiring qualifications>
□Yes □No
6-1. How long are your average hours spent studying on weekdays, excluding class hours?
6-2. What are your total hours spent studying within one week, excluding class hours?

Note: Phrases in brackets show the short words used in Table 2.

degree of motivational strength, which can be used to develop a strategy for improving learning motivations.

2. Methods

2.1 Participants

The questionnaire survey was conducted among Department of Medical Engineering students from September 2017 to October 2018. The questionnaire responses were collected after informed consent was obtained from the respondents and partially completed questionnaires were excluded. The final number of respondents was 186 students（106 male, 80 female）. To avoid the duplication of responders, the target of analysis for this study was limited to new students in the 2018 academic year and all students in the 2017 academic year. The number of students in each grade were 77, 36, 36, and 37 for the first, second, third, and fourth years, respectively.

2.2 Questionnaire

The questionnaire was conducted to assess the influential factors on academic performance. The questionnaire items evaluated in this study were as follows: application period（i.e., time taken between deciding to apply and entrance examination）, opportunity for course selection, future vision, coincidence between the desired plan and the actual course, intention to acquire qualifications, and learning time. The questionnaire response data are shown in Table 1.

2.3 Statistical Analysis

Statistical significance was assessed by the chi-squared test and Spearman's rank correlation coefficient. A p value of < 0.05 was considered statistically significant. Statistical analyses were performed with SPSS software（version 19.0; SPSS,

Table 2. Participants' characteristics and questionnaire results

	Average ± SD ratio (%)
N	186
Male	106 (57 %)
Female	80 (43 %)
1. Application pe riod	
< 1 month	17 (9.1 %)
1 to < 3 months	23 (12.4 %)
3 to < 6 months	31 (16.7 %)
6 to < 12 months	41 (22 %)
1 year	35 (18.8%)
2 years	20 (10.8%)
≥ 3 years	19 (10.2%)
2. Opportunity for course selection	
own intention	86 (46.2%)
family recommendation	19 (10.2%)
teacher recommendation	47 (25.3%)
advice from friend	4 (2.2 %)
workplace experience	8 (4.3 %)
open campus	9 (4.8 %)
others	13 (7 %)
3. Future vision	
techniques	130 (69.9 %)
research activities	3 (1.6 %)
educator	4 (2.2 %)
own time	35 (18.8%)
another purpose	3 (1.6 %)
household	7 (3.8 %)
others	4 (2.2 %)
4. Course coincide nce	
Yes	102 (54.8 %)
No	84 (45.2%)
5. Acquire qualifications	
Yes	172 (92.5 %)
No	14 (7.5 %)
6-1. Le arning time [h/day]	0.69 ± 1.09
6-2. Learning time [h/week]	4.94 ± 6.9

Note: Data are shown as numbers (%). SD, standard

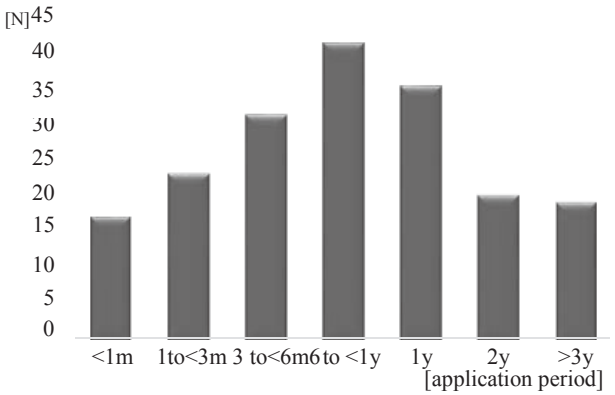

Figure 1. Number of responders due to the duration of the application period.

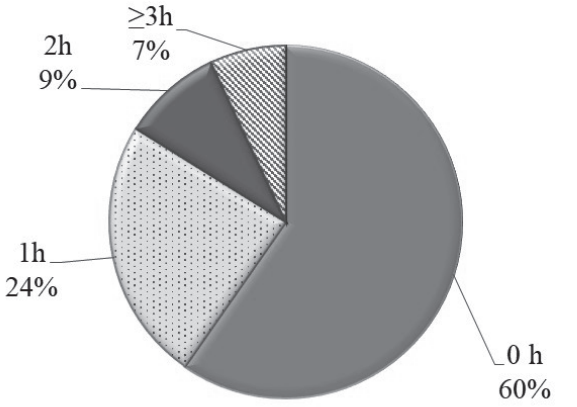

Figure 2. Rate of responders due to learning time per day. The data are shown as percentages.

Tokyo, Japan).

3. Results

The participants' characteristics are shown in Table 2. Considering the application period, the most common response was "6 to < 12 months" (22%), followed by "1 year" (18.8%) and "6 to < 12 months" (16.7%). It is noteworthy that 10.2% of respondents answered "≥ 3 years" while 9.1% of the respondents answered "< 1 month" (Fig. 1).

Considering opportunity for course selection, the most common response was "own intention" (46.2%) followed by "teacher recommendation" (25.3%) and "family recommendation" (10.2%). "Own intention" was the most dominant answer for nearly half of the respondents. However, the rate of responses for "experience" and "open campus" were 5% or less.

Considering future vision, the most common response was "engineer" (70%) followed by "myself" (19%). There were no items for the other answers that were over 5%.

Considering course coincidence, 54.8% responded "Yes" while 45.2% responded "No."

Considering the acquisition of qualifications, most students (92.5%) showed an intention to obtain the related prerequisite qualifications for their university course.

The average number of hours for learning time was 0.72 ± 0.85 h per day and 4.94 ± 6.9 h per week. The details of learning time per day are shown in Fig. 2. Sixty percent of students rarely studied on weekdays, while 16% of students studied over 2 h per day. When

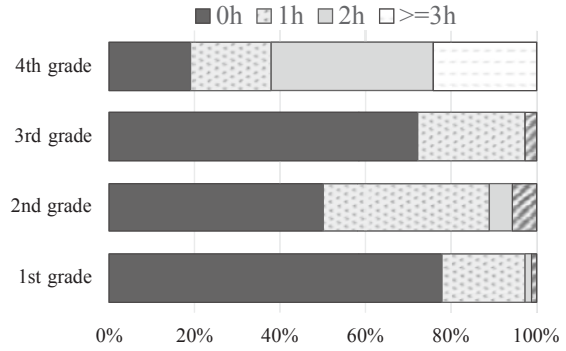

Figure 3. Results of grade-based learning time per day. Data are shown as percentage.

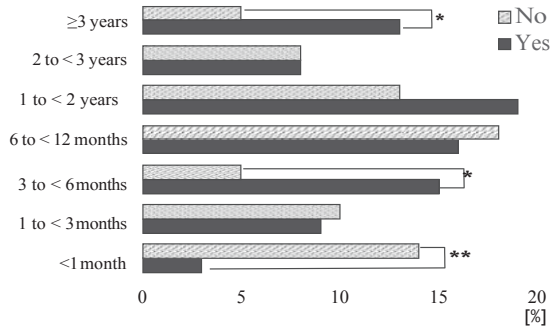

Figure 4. Comparison of appreciation period with the "Yes" and "No" groups.The "Yes" group matched their future plans with their actual course, while the "No" group mismatched their plans with their course. The data are shown aspercentages. (*: $p < 0.05$, **: $p < 0.01$).

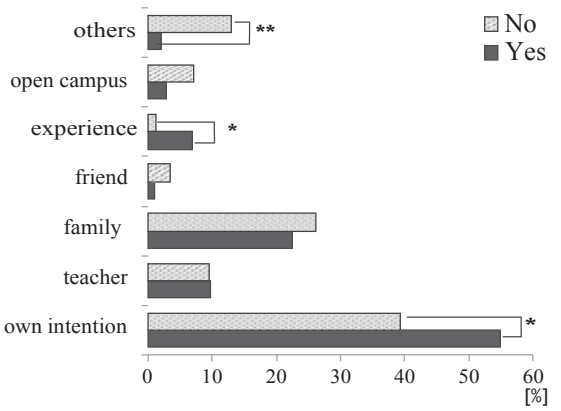

Figure 5. Comparison of opportunity for course selection with the "Yes" and "No" groups. The "Yes" group matched their future plans with their actual course, while the "No" group mismatched their plans with their course. The data are shown as percentages (*: $p < 0.05$, **: $p < 0.01$).

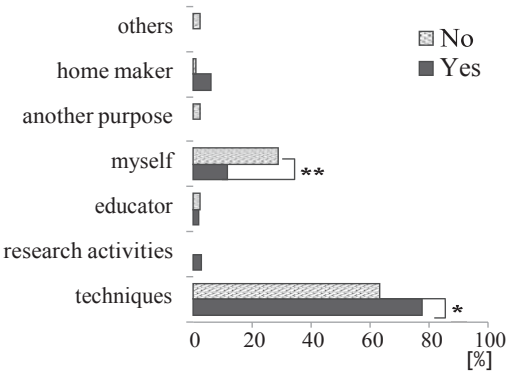

Figure 6. Comparison of future vision with the "Yes" and "No" groups. The "Yes" group matched their future plans with their actual course, while the "No" group mismatched their plans with their course. The data are shown as percentages (*: $p < 0.05$, **: $p < 0.01$).

analyzed by grade-based learning time, the percentage of students decreased as the learning time increased between the first and third grades (Fig. 3). However, this factor changed in the fourth grade. The most dominant learning time was "2 h" (37.8%) followed by "over 3 h" (27.3%), "0 h" (16.2%), and "1 h" (16.2%). The rate of students who studied over 2 h per day were very few from the first to third grades, while it rapidly increased in the fourth grade.

Next, the respondents were classified according to the "course coincidence" results. The students who answered "Yes" or "No" were assigned to the "Yes" or "No" groups, respectively. After comparing the two groups, distinctive features appeared in some questionnaire items. Considering appreciation periods, significant differences were seen in the periods of "< 1 month," "3 to < 6 months" and "≥ 3 years" ($p < 0.01$, $p < 0.05$, and $p < 0.05$, respectively) (Fig. 4). Interestingly, the "No" group was dominant during the short-term application period while the "Yes" group was dominant in the long-term application period.

Considering opportunity for course selection, significant differences were seen in the questionnaire items of "own intention", "experience" and "others" ($p < 0.05$, $p < 0.05$ and $p < 0.01$, respectively) (Fig. 5). The "Yes" group was dominant in "own intention" and "experience" while the "No" group was dominant in "others."

Considering future vision, significant differences were seen in the questionnaire items of "techniques" and "myself". The "Yes" group was dominant in

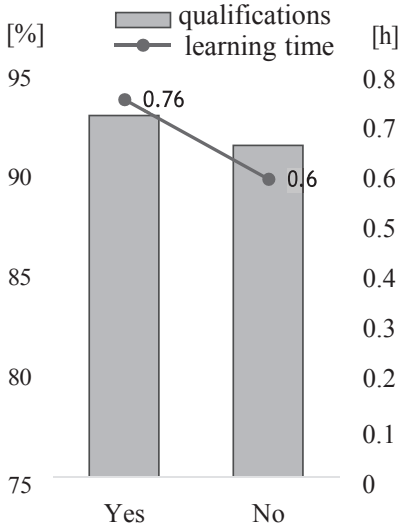

Figure 7. Comparison of the rate intending toobtain qualifications (bar graph) and the average learning time (line graph) with the"Yes" and "No" groups. The "Yes" group matched their future plans with their actual course, while the "No" group mismatchedtheir plans with their course. The data are shown as percentages [%] and number of hours [h].

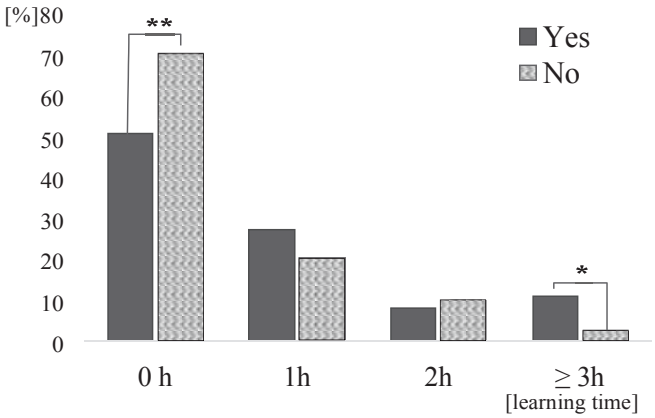

Figure 8. Comparison of learning time with the "Yes" and "No"groups. The "Yes" group matched their future plans with their actual course, while the "No" group mismatched their plans with their course. The data are shown as percentages (*: $p < 0.05$, **: $p < 0.01$).

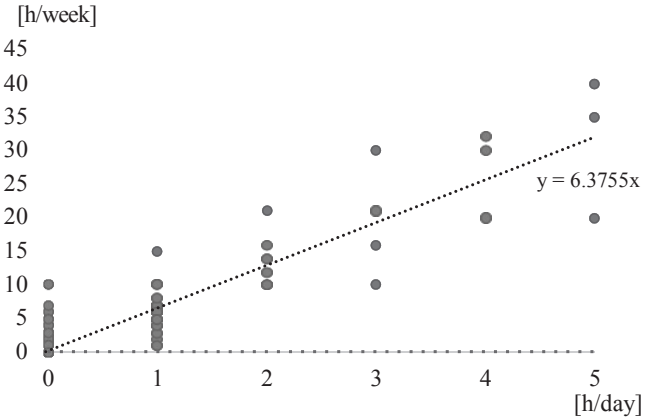

Figure 9. Correlation between learning time per day and per week. Thedata are shown as the number of hours. The broken line shows the linear approximation.

"techniques" ($p < 0.05$) while the "No" group was dominant in "myself" ($p < 0.01$) (Fig. 6). In medical engineering-related items, such as "techniques" or "research activities," a higher proportion of respondents belonged to the "Yes" group. However, in personal growth-related items, responses such as "myself" or "another purpose" belonged to the "No" group.

Finally, the comparison of the two groups' results for acquire qualifications and learning time is shown in Fig. 7. Because most of the responders intended to obtain the related qualifications while studying at university, there were no significant differences between the two groups, even though there were slightly more positive answers from the "Yes" group. In contrast, the average number of learning hours per day in the "Yes" group was significantly longer than that in the "No" group ($p < 0.05$). The details of learning hours in the two groups are shown in Fig. 8. In the comparison of the two groups, the "No" group was dominant in the division "0 h" while the "Yes" group was dominant in the division " $\geq$ 3 h" significantly ($p < 0.01$ and $p < 0.05$, respectively). In this study, the students' learning situation was assessed by their learning time per day. For confirmation, the learning time per day was correlated with that per week (Fig. 9). A linear approximation was obtained in the figure. An analysis showed a strong correlation using the Spearman's rank correlation coefficient ($rs = 0.8344$, $p < 0.01$).

4. Discussion

Learning depends on several influential factors, such as the educators, the students themselves, the course/curriculum, and the educational environment. Over the years, there has been a gradual shift in the focus of medical education from a teacher-centered, passive

learning approach to a student-centered, active learning approach[12–15]. Learners' intrinsic motivation is important because highly motivated students are more attentive to their learning processes and outcomes than poorly motivated students[16]. In addition, students who are motivated to increase their efforts to learn a difficult task display higher levels of proficiency[17].

This study focused on the source of learners' intrinsic motivation, and investigated the effect of motivation because focusing on learners' intrinsic motivation is thought to be a more influential factor in enabling academic improvement[18]. Individual learners' intrinsic motivations can be affected by their previous experiences, by their desire to achieve, and the relevance of their learning to their future[19]. To investigate the degree of learners' motivation, this study focused on the effect of consistency with their desired plan before enrollment and the actual course. The results of this study showed several notable results.

First, there were fewer learners whose desired plan was mismatched with their actual course in the rate of selection of course selection by "own intention". In addition, as a future vision, more responders chose other plans other than medical engineering in the mismatched learners. Obviously, their average learning time was shorter than those students who matched their desired plan with the actual course.

Considering learning time, this study focused on the time spent studying during a weekday. Many studies used higher grade point average in school performance[20–23] or standardized examinations[20, 24] to evaluate the students' academic performance. However, what was interested in this study was not the students' attained academic performance but their self-consciousness to improve their academic achievements. Daily self-learning requires greater effort and enthusiasm for learning. Therefore, this study regarded the learning time during a weekday as a degree of the students' intentions for learning. Of course, there could be a case for intensive studies during weekends because some students may be busy doing part-time jobs or commuting on the weekend. However, the results of this study indicated that daily learning time is well correlated with the weekly learning time. This result shows that the weekday learning time sufficiently represents the learning situation.

Second, mismatched learners were dominant in the short-term appreciation period within 3 months and especially within 1 month. In contrast, the matched learners were dominant in the long-term period over 3 years. Certainly, to realize future visions, enough time is required for deep consideration and preparations for acquiring the required scholastic ability. This result suggests the importance of early decisions for future plans, especially by junior or early high school students. The students' motivation sources included various aspects, such as their goal orientation, attributions, self-efficacy beliefs, outcome expectations, social sources, and interests[25]. To confirm future visions, however, an effective method would be to provide opportunities for junior high school students to be exposed to roles in the medical field. While many students had limited knowledge about the required qualifications for the medical field, many of these students unintentionally entered medical school. In addition, the educational institution's employment placement activities at an early stage of junior high school or primary school would lead to the production of competent human resources for the medical engineering field.

Several limitations of this study should be considered. First, this study could not observe changes over time in a specified grade. Second, more data are needed to confirm the study results. Third, more data from other facilities are needed for comparison to confirm the hypotheses of this study.

In conclusion, consistency within the students' future plans and the actual course influences their learning situation after enrollment. Establishing a firm determination for a future path before admission is an influential factor for the learning motivation of medical technology students, which leads to better academic performance.

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