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The effect of motivation and learning behaviour on student achievement

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The purpose of this study is to determine the direct effect of intrinsic and extrinsic motivation on learning behaviour; the direct effect of intrinsic and extrinsic motivation and learning behavioural on learning achievement; the indirect effect of intrinsic and extrinsic motivation from learned behaviour to learning achievement; and the influence of intrinsic and extrinsic motivation and learning behaviour on the learning achievement of the biology education department students of FKIP Undana. This is a correlation study, consisting of three independent variables and one dependent variable. Data collection was done by a questionnaire and a document of learning achievement. Data were analysed descriptively and inferentially with path analysis. The results show that intrinsic motivation has a direct effect on learning behaviour, and that both directly affect learning achievement; intrinsic and extrinsic motivation and learning behaviour jointly affect the learning achievement of the students of the biology education department.

Keywords: learning achievement; learning behaviour; motivation

Introduction

Quality in higher education is not only determined by lecturers, but also by the standards of competency, content, processes, facilities and infrastructure, management, and education assessment (Badan Standar Nasional Pendidikan, 2015). Each standard cannot stand alone, but mutually supports the other. By ignoring one of the standards, this will disrupt the balance of the system.

One of the standards that relates directly to the needs of society and the world of work is the competency standard. According to this, graduates are expected to have sufficient competence in accordance with the needs of society and the work market. To develop the quality of graduates in terms of attitudes, skills and knowledge, support in terms of content, processes, educators and staff, infrastructure, financing and assessment standards are required. In addition, aspects of student motivation and learning behaviour constitute a key factor in the achievement of graduation standards. Students with high motivation to learn and with good learning behaviour tend to achieve the required competency standards.

The observations showed that the students' learning achievement of the Biology Education Department in the form of Grade-Point Average (GPA) is generally is under 3.0. A total of 186 students from the academic year 2014/2015 of 265 students have a GPA of less than 3.0. Other facts also show that a GPA level at least 3.0 is one of the requirements to apply for a job, as well as a participant of SM3T (one of the programmes of the government to serve as teachers in remote areas).

To solve this problem, research is needed to uncover the factors causing low GPA. Several factors are suspected to be the cause of a low GPA, such as learning behaviour, learning motivation, lecturers' competence, supporting facilities and infrastructure, student lodging conditions, relationships among the students, excessive use of Information Technology (IT), parental support, and other factors.

This research focused on motivation and learning behaviour of students. Motivation and learning behaviour are two very important factors in determining students' learning achievement. Learning motivation, both from the students themselves, as well as from outside, will determine students' learning behaviour. Winardi (2011) notes that our behaviour is generally motivated by a desire to achieve certain goals. Dewandini (2010) notes that the final process of motivation is completing an action that can provide satisfaction. Herath (2010) argues that both intrinsic and extrinsic motivation serve to reinforce attitudes towards behaviour, while Darnton (2008) argues that motivation constitutes a liaison between attitudes and behaviour in the model Theory of Reasoned Action (TRA). Motivation is not only important in encouraging students to learn, but also in helping students in achievement (Anni, 2006). Setyowati (2007) suggests that the influence of learning motivation on the learning outcomes of students of class VII SMPN 13 Semarang of 29.76 percent.

Research shows that students are motivated to teach by a teacher profession allowance of one-time basic salary, as well as the high market requirement for teachers. This means learning behaviour is motivated by salary (as per wage economic theory) by means of which to achieve high learning outcomes. Most of the contemporary motivational theories enjoy a substantial amount of supporting research (Robbins & Judge, 2009). In the student circle, the motivation of becoming a teacher to earn a high salary is relevant to the theory of the contemporary economy.

Results of Metriana study (2014) showed that motivation, learning behaviour and self-efficacy give the positive effect significantly on achievement. Ermawati (2013) also points out that the habit of following lessons, reading textbooks, visiting libraries, readiness to take exams, simultaneously affect the value of mathematics

and English and the level of understanding of accounting subjects. Meanwhile, Rismayana (2012) showed that there is no influence of learning behaviour and stress on student achievement on accounting material.

Based on the aforementioned problems, the researcher argues that this research is highly important in revealing those factors that affect the students' learning achievement in Biology Education. This finding could be used to improve and enhance motivation and learning behaviour so that learning achievement increases in accordance with the graduates' competency standards.

Methods

Research Setting

This research was conducted in the Biology

Education Department, Faculty of Teacher Training and Education, the University of Nusa Cendana, from July to October 2015.

Research Design

This research is correlational study. Independent variables consist of intrinsic motivation (X1), extrinsic motivation (X2), the learning behaviour (X3), and a dependent variable, the learning achievement (X4). The direct effect of independent variables either individually or jointly and the independent variables to the dependent variables through intermediates variables is described in Figure 1.

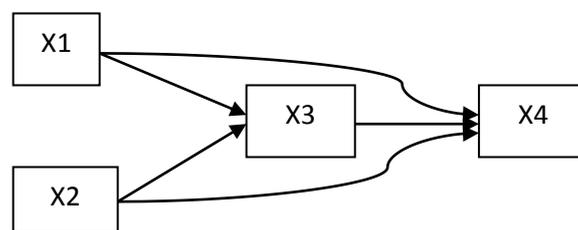


Figure 1 Effect of the independent variables on the dependent variable

Population and Sample

The population were all students of the Biology Education Department, Faculty of Teacher Training and Education, University of Nusa Cendana in the academic year 2014/2015 of II, IV, VI and VIII semester with a total of 229 students. Learning behaviour and learning motivation were assumed to be different, according to each semester, after which sampling was conducted by proportioned stratified sampling technique (Sugiyono, 2013). The number of samples taken from the population was 54 people, with the following details: a total of 24 percent of the second half, 35 percent of the fourth semester, and 41 percent of the 6th semester.

Data Collection

Learning achievement data in the form of a cumulative achievement index (CAI) was taken from the first semester of academic year 2014/2015 at the academic division of Biology Education Department. Data regarding intrinsic and extrinsic motivation and learning behaviour were collected by distributing questionnaires in the form of the Likert scale.

Research Instrument

The instrument used to collect the data of intrinsic and extrinsic learning motivation and learning behaviour is a questionnaire with a scale of 1 to 5. On the motivation variable, respondents who answered 'strongly disagreed' were given a score

of 1, those who 'disagreed' were given a score of 2, those who 'agreed to some extent' a score of 3, those who 'agreed' were given a score of 4, and those who 'strongly agreed' were given a score of 5. In terms of variable of learning behaviour, the response of 'never' resulted in a score of 1; 'hardly ever' resulted in a score of 2; 'rarely' resulted in a score of 3; 'often' resulted in a score of 4; and 'always' resulted in a score of 5. Learning achievement was measured in the form of a CAI score from 1.0 to 4.0. This number is converted to an interval scale of 1 to 5 in the following way: the highest score minus the lowest score divided by 5 to obtain the width of class 0.6. Students who have CAIs between 1.0 - 1.6 are given a score of 1 (very low); $1.6 \leq \text{CAI} < 2.2$ are given a score of 2 (low); $2.2 \leq \text{CAI} < 2.8$ are given a score of 3 (medium); $2.8 \leq \text{CAI} < 3.4$ are given a score of 4 (high); and $3.4 \leq \text{CAI} < 4.0$ are given a score of 5 (very high).

Data Analysis Techniques

The data collected is arranged and grouped by semester. Further data was analysed with descriptive and inferential statistics. Inferential Analysis with Path Analysis by Statistical Product and Service Solutions (SPSS) 20 (Wahyono, 2012). Path analysis was performed after data normality test by Kolmogorov-Smirnov method, homogeneity of variance by the Bartlett test, and linearity by *F* test, based on deviation from linearity (Sugiyono, 2013).

Results

Characteristics of Respondents

The results showed that the age of respondents ranged from 18 to 23 years. As many as 25.48 percent of respondents aged 20 years. While based on gender, the number of male respondents was 33.3 percent, and a female was 69.7 percent. As many as 30 percent of respondents live with family, and 70 percent of respondents live in a boarding house.

Correlation between Variables

Based on the model pattern proposed as part of the research method, the path analysis consisted of some sub-structures. The results of the correlation coefficient calculation are presented in the form of a correlation matrix as presented in Table 1.

Table 1 The correlation matrix between variables

	X1	X2	X3	X4
X1	1	0.904**	0.635**	0.763**
X2	0.904**	1	0.532**	0.664**
X3	0.635**	0.532**	1	0.860**
X4	0.763**	0.664**	0.860**	1

Note. **Correlation is significant at the 0.01 level (2-tailed).

Based on Table 1, it can be argued that the relationship between variables is at a highly significant level. The stronger relationship between the variables X1 and X2, with a correlation coefficient of 0.904, and a weaker relationship between X2 and X3, with a correlation coefficient of 0.532.

Table 2 Summary of path analysis

No	Effect of variables	F	t	R ²	ρ	Sig
1.	X1 + X2 to X3	17.939		0.413		0.000
2.	X1 to X3		3.354		0.843	0.002
3.	X2 to X3		-0.914		-0.230	0.363
4.	X1 + X2 to X4	36.027		0.586		0.000
5.	X1 to X4		4.212		0.884	0.000
6.	X2 to X4		-0.662		-0.140	0.511
7.	X1 + X2 + X3 to X4	75.031		0.818		0.000
8.	X1 to X4		2.300		0.359	0.000
9.	X2 to X4		0.034		0.005	0.973
10.	X3 to X4		8.001		0.630	0.000

Note. F = analysis of variance, t = partial effect, R² = mutual effect, ρ = path coefficient.

Path Analysis

The result of Path Analysis displayed in Table 2.

Based on Table 1 and Table 2, the model

pattern of the influence of motivation and learning behaviour to the students' learning achievement as presented in Figure 2.

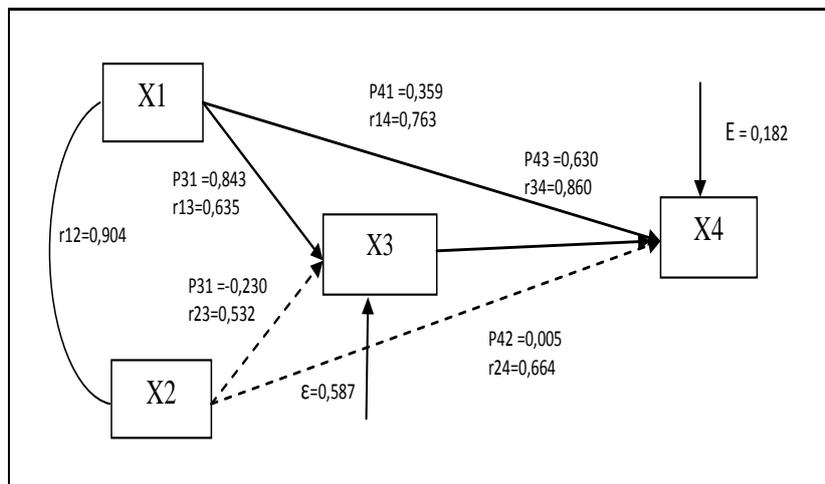


Figure 2 Effect of independent variables on dependent variables

Note. ρ = path coefficient, r = correlation coefficient, ε = effect of undeterminable variables.

Based on the model pattern generated, it can be stated that:

1. intrinsic motivation directly affects learning behaviour and learning achievement;
2. extrinsic motivation indirectly affects learning behaviour and learning achievement;
3. learning behaviour directly influences learning achievement; intrinsic motivation through learning behaviour has an indirect influence on learning achievement;
4. intrinsic and the extrinsic motivation jointly affects learning behaviour; and

5. intrinsic and extrinsic motivation, as well as learning behaviour jointly affects the learning achievement of students.

Discussion

The Direct Influence of the Intrinsic and the Extrinsic Learning Motivation Upon Learning Behaviour is as Follows

The results of path analysis showed that $\rho_{31} 0.843 > 0.05$ or significance $0.002 < 0.05$, so it was concluded that there is a direct effect of learning motivation on learning behaviour, with a contribution of $(0.843)^2 \times 100\% = 71.07$ percent; while the results of the analysis $\rho_{32} -.230 < 0.05$ or significance $0.365 > 0.05$, so it can be concluded that there was no direct influence of extrinsic motivation on learning behaviour.

Based on these results, counselling or spiritual guidance and other activities are required in order to enhance the intrinsic motivation mean, by which to improve student learning behaviour of the Biology Education Department. Although extrinsic motivation did not directly affect the student behaviour, learning activities, social communication, learning facilities, and infrastructure ought to be improved in order to stimulate and motivate students to change their learning behaviour.

Indicators of intrinsic motivation, such as interests, ideals and ability directly influence the learning behaviour of the students, which consists of the habit of following lectures, reading books, visiting the library, readiness to take the exam, and searching the internet. This learning behaviour arises from students; the desire to study biology, the aspiration to be a Biology teacher, and their ability to follow the lectures, finish assignments, conduct lab work; and take exams. The results of the descriptive statistical analysis showed an average score of intrinsic learning motivation of 105.20 (middle category).

Intrinsic learning motivation is the driving force that arises from the students in the form of desire, aspiration, and ability to become a biology teacher. Intrinsic learning motivation is related to psychological problems. Uno (2012) has suggested the motivation to be the power contained within the individual, which causes the individual to act. Zhu and Yang (2012) explain the motivation to be a psychological tendency and internal impulse, which stimulates and regulates the actions of an organism. Hilda, Nahusona and Toto (2004) likewise find intrinsic motivation to be an encouragement that comes from inside a person, related to satisfaction. Danim (2012) states that from the effective aspect, motivation constitutes meaningful attitudes and basic values held by a person or group regarding whether or not to act. Sriyanti (2009) defines motive as a force that comes from inside a person, which causes the person to perform an act. Behaviour is affected by motivation, attitude and

knowledge (Tokan, 2016; Tokan & Imakulata, 2017). Amrai, Motlagh, Zalani and Parhon (2011) state that motivational factors play a crucial role in academic achievement, since the academic achievement of students is related to the society's development. Based on these results, it can be argued that the stronger the intrinsic learning motivation, then the better the students' learning behaviour.

The results showed that extrinsic motivation has no direct effect on learning behaviour. Indicators of extrinsic motivation, such as encouragement of parents, the competence of lecturers, infrastructure and social communication have no effect on learning behaviour, such as the habit of following lectures, reading books, visiting the library, readiness to take exams, and use of the internet to search for course materials. Schulze and Lemmer (2017) meanwhile state that the family can play a role in promoting science learning. Juan and Visser (2017) finds that both the school and home environments play important roles in students' science achievement. Walgito (2003) has suggested that learning behaviour is measured by the habit of following the lesson, the habit of reading textbooks, visits to the library, and the habits of the exam. Schulze and Van Heerden (2015) state that there is an apparent lack of motivational value of the science learning environments at schools for white and coloured students. This implies that teachers need to rethink the teaching methods they use, the lesson activities they present, and the personal attention they provide to students.

The results showed that the correlation coefficient between extrinsic motivation and learning behaviour amounted to 0.532, which is highly significant at one percent. Although the correlation is highly significant, the correlation between these two variables is in the moderate category. Sugiyono (2013) states the degree of moderate correlation to be 0.4 to 0.599.

Based on these results, it is necessary to take corrective action to increase extrinsic motivation. Factors requiring correction related to indicators of extrinsic learning motivation, i.e. application of strategies, models, methods and learning techniques. Although the learning approach is not student-centred, the learning strategy applied by lecturers in learning requires serious attention. Learning by linking things that are factual needs to be developed by the lecturers. If learning is only centred on the material in modules, dictation or textbooks, without relating to facts and real phenomena, students are likely to become bored.

Emotional relationships between lecturers and students need to be fostered and developed. Students will find it convenient to attend college or work on assignments and tests if there is a harmonious emotional bond between students and lecturers. Limited laboratory equipment also

constituted a factor inhibiting student learning behaviour. Students are not involved directly in the lab, due to a lack of equipment and lab materials, which results in the reluctance of students to work in the laboratory. This requires additional tools and lab materials, according to the needs of students. Lecture and laboratory rooms are cramped in a way not in accordance with their capacity; cleanliness is an issue; the voltage is not stable and will cause an uncomfortable atmosphere that affects student learning behaviour.

Based on these results, it is concluded that the learning behaviour of students needs to be motivated. Linggasari (2008) states that behaviour requires motivation, whether intrinsic or extrinsic. Djamarah (2002) has suggested that the main motivation for learning is more intrinsic than it is extrinsic. Intrinsic motivation will cause a person to be slightly detracted from the outside, whereas extrinsic motivation causes a person to be influenced by factors beyond himself.

The Direct Effect of Intrinsic and Extrinsic Motivation and Learning Behaviour on the Learning Achievement

The results of path analysis showed $\rho_{41} 0.359 > 0.05$ with the significance of $0.026 < 0.05$, where it can be concluded that intrinsic motivation directly affects learning achievement. The result showed $\rho_{42} 0.005 < 0.05$, with the significance of $0.973 > 0.05$, where it was possible to conclude that extrinsic motivation indirectly affected learning achievement of students. $\rho_{43} 0.630 > 0.05$, with a significance of $0.000 < 0.05$, thus concluding that the learning behaviour directly affects the learning achievement of students.

Based on the results of path analysis, the contribution of intrinsic motivation on learning achievement was $(0.359)^2 \times 100\% = 29.05$ percent. These results illustrate that students with strong intrinsic motivation will acquire high academic achievement. Danim (2012) has stated the motivation to be the power, encouragement, needs, spirit, pressure, or psychological mechanisms that drives a person or group to reach specific achievements in accordance with personal motivation.

The results of path analysis also show the path coefficient to be $\rho_{43} = 0.630$, revealing the contribution given by the learning behaviour toward the learning achievement to be $(0.630)^2 \times 100\% = 39.69$ percent. The results of this research show that learning behaviour directly affects the learning achievement of students. The more often a student shows positive learning behaviour, the better their academic achievement. Student learning behaviour, such as the habit of following lectures, reading books, visiting the library, readiness to take exams, and searching for the course materials on the internet can affect the learning achievement of

students. Habits include taking classes, coming on time, listening seriously, asking when one does not understand, reading the course material before the lecture takes place, making a summary, and discussing with friends that can improve the learning achievement. Sriyanti (2009) found positive study habits to affect student achievement in these subjects at senior high school at Brebes in Central Java.

Other learning behaviours, such as visiting the university library, faculty and provincial library, help students to prepare for the exam schedule, found that examining course material via the internet can improve achievement. According to Crow and Crow (1988), some of the factors that influence a person's learning achievements including the following: (1) environmental factors; (2) evaluation of learning; (3) quality lecturers; (4) achievement motivation; and (5) physical condition.

In connection with this research, the environment includes classroom atmosphere and infrastructure that support student learning behaviour. The evaluation study conducted by a lecturer encourages students to correct their learning behaviour. In addition, the quality of lecturers is not only seen from their professional competence, but also seen from pedagogical, social and personal competence. The quality of lecturers also determines the learning behaviour of a student. The competent lecturer is likely to improve student learning behaviour and ultimately affect learning achievement. Intrinsic motivation includes interests, ideals, and the ability to encourage students to acquire high academic achievement. In addition, learning achievement is not only influenced by physical condition, but also by a psychological condition. Health and sickness, strength and weakness, and sadness and happiness, likes and dislikes, all affect learning achievement. Harmonious relations among students and between students and lecturers affect learning achievement. This is in accordance with Slameto (2003), who notes that there are two factors that affect student achievement, namely internal and external factors. Internal factors consist of physical factors, psychological factors, and health factors. External factors consist of family, school, and community. Hanifah and Abdullah (2001) argue that a student's academic achievement is the result of an interaction of the various factors that influence it, both internally and externally.

The Indirect Effect of Intrinsic Learning Motivation through Learning Behaviour on Learning Achievement

The results of path analysis showed a direct effect of intrinsic motivation on the learning behaviour $\rho_{31} 0.843$, and the direct effect of learning behaviour on learning achievement $\rho_{43} = 0.630$.

Thus, the indirect influence of intrinsic motivation on learning achievement through learning behaviours of $0.843 \times 0.630 = 0.530$, results in a contribution of $(0.530)^2 \times 100\% = 28.21$ percent.

The results of this study also indicate that intrinsic motivation indirectly influences learning achievement through learning behaviour. Learning behaviour, such as the habits of attending college, visiting the library, readiness to take the exam, as well as frequency of accessing the internet will be strengthened by the interests, ideas and abilities to facilitate Biology Education students improve learning achievement. This result illustrates that learning behaviour can act as an intermediate variable of intrinsic motivation and learning achievement. Learning motivation strengthens learning behaviour. A student with high learning motivation, but with bad learning behaviour, experiences low learning achievement.

Joint Effect of Intrinsic and Extrinsic Motivation Toward Learning Behaviour

Table 2 shows that the value of F count 17.939 with a significance of $0.000 < 0.05$, thus concluding that intrinsic and extrinsic motivation jointly affect students' learning behaviour. Intrinsic motivation, such as the interests, aspirations and the ability and extrinsic motivation, such as the encouragement of parents, lecturer competence, infrastructure, and social communication, are jointly capable of affecting the learning behaviour of the students in the Biology Education Department. Other factors influencing learning

behaviour according to the following: $1 - R^2 = 1 - 0.413 = 0.587$. The results have shown that 58.7 percent of other factors affect learning behaviour.

The Joint Effect of Intrinsic and Extrinsic Motivation and Learning Behaviour Toward the Learning Achievement

Table 2 shows the value of F count 75.031, with a significance of $0.000 < 0.05$, where it can be concluded that intrinsic and extrinsic motivation and learning behaviour jointly affect learning achievement. Intrinsic motivation, such as interests, aspirations and the ability and extrinsic motivation, such as parental support, the competence of lecturers, infrastructure, and social communication, as well as learning behaviour, such as the habit of attending class, visiting the library, reading a book, readiness to take an exam, and internet searches can jointly influence learning achievement.

The value of R^2 of 0.818, thus another factor which may also influence the learning achievement of students of $1 - R^2 = 1 - 0.818 = 0.182$. Thus, it can be concluded that the influence of external factors on the learning achievement is 18.2 percent. Other factors allegedly also influence the learning achievement such as health, psychology, evaluation of learning and several others.

Total Effect

Based on the model pattern, the total effect of the independent variable on the dependent variable is as depicted in Table 3.

Table 3 Total effect of independent variables to the dependent variable

Effect of variables	Direct	Indirect through X3	Total
X1 to X3	0.843		0.843
X1 to X4	0.359	0.530	0.889
X3 to X4	0.630		0.630
ϵ_3			0.587
ϵ_4			0.182

Based on Table 3, it is concluded that the influence of other undetectable variables in this research is 0.182, while the influence of intrinsic motivation variable and learning behaviour upon learning achievement is 0.818. Other variables that are suspected to have an effect on the learning achievement include health, residential environment, and psychological condition of the students.

Conclusion

Based on the results and discussion, it was concluded that:

1. Intrinsic motivation directly affects learning behaviour and learning achievement of students in the Biology Education Department.
2. Learning behaviour directly affects the learning achievement of students in the Biology Education Department.

3. Intrinsic and extrinsic motivation jointly affect learning behaviour of students in the Biology Education Department.
4. Intrinsic motivation, extrinsic motivation and learning behaviour jointly affect the learning achievement of students in the Biology Education Department.

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Authors' Contributions

Moses Tokan is the main author and was responsible for designing instruments, collecting data, analysing data, discussing, compiling manuscripts and making revisions. Mbing Maria Imakulata, the co-author, helped with data

collection, collection of literature, illustrating the schema of relationships between variables, and assisting in data analysis.

Notes

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