Literature Review and Study Design: Does Number of Friends Full-Time Undergraduates Have Correlate with Their Grade-Point Averages (GPAs)?

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Abstract

This paper was designed to be a comprehensive review of literature, from which inform future study design. The investigation focused on the relationship between the number of friends full-time college students have and their grade-point averages. Academic retention and persistence were examined as well since the rate of retention and persistence and academic excellence are intercorrelated and often coexist. Outside factors that could potentially affect the relationship between the number of friends and GPA, such as gender, living arrangement, satisfaction with college environment and overall life were also assessed. Based on the literature reviewed, it was established that the more friends undergraduates have, the more social support they perceive, the happier and more satisfied with college life they are, and the higher GPA they obtain. However, due to limited time and capability of a person to make and maintain relationships, an upper threshold of number of friends must be imposed, above which the burden of relationships becomes taxing on students' mental health. The diminution in degrees of impact of high school friends, compared to that of new college friends, on undergraduates confirms that maintaining relationships, in particular friendships, takes time and effort. Therefore, when the size of undergraduate's network becomes too big, the available time for intimate friends and for studying is compensated, thinning the positive effect of social support and inflicting undergraduates' potential capability and performance. Since the hypothesis was generated from previous researches and reports, plausible survey parameters were suggested to either disprove or further support the hypothesis.

Keywords: Number of Friends, Grade-Point Averages, Undergraduates

1. Introduction

The fates of students who decided to go to college usually fall into one of three categories: firstly, graduate with high grade-point average (GPA) and sometimes with honors and go to graduate school or get employed for a job that pays better than their peers who did not go to college; secondly, drop out, more likely at the end of first semester first year, in tens of thousands dollar debt; lastly, graduate with a bachelor's degree but low GPA, unable to get into any graduate schools as planned, facing the decisions between retaking courses at advanced levels to pull GPA up and be more competitive for graduate school or entering the workforce and abandon dream of graduate and doctoral level educations. Peterson, Director of Minnesota's Future Doctors at University of Minnesota Medical School, advises pre-medical students to spend approximately 60% of their time in preparation for GPA and MCAT (an entrance exam for medical school)[25]. The uneven distribution of time for GPA and MCAT in comparison to leadership, community services, research experiences and interests in medicine indicates the importance of GPA and entrance exam scores in the process of getting into medical school in particular, and into graduate level schools in general. Even though a majority of schools do not have an absolute cut-off range for GPA, students with GPA less than 3.0 average have a significantly lower chance of getting into their dream schools. In fact, Association of American Medical Colleges provides evidence that for students with the same range of MCAT score, students with higher GPA have a significant

higher chance of being accepted into at least one medical school, and vice versa[1]. At least for admission to graduate schools, as GPA decreases, the door opens for these schools gets narrower and narrower until it is exceptionally hard and rare to get admitted. Even in the work force, GPA matters for recent graduates. Khoo and Ost suggest that graduating with honors provides benefits in terms of earnings within the first two years of graduation[16]. And GPA is the factor that determines if students are awarded honors, as each school establishes its own GPA threshold, above which an honors recognition is given.

If a student drops out, the consequences would be more unbearable than if s/he is at least able to obtain a bachelor's degree as planned. One of the most prominent consequences of not being able to complete the higher education is monetary loss. For society, the loss is indicated in the claim of Federal Reserve Bank of New York that at the end of 2016, the amount of student debt is $1.3 trillion, and nearly half of borrowers are not repaying[14]. That trillion worth of money, instead of being spent on something else that is urgent and useful for society, is now stuck there as a hole in national budget. Students do not pay back simply because they are unable to, in most cases. They are either unemployed or offered a job which salary is less than or equal to monthly payment. Debt burden is assessed by calculating the ratio of borrowers' cumulative federal debt to their annual income 6 years after they first enrolled in universities[34]. Noncompleters, undergraduates who are unable to obtain a degree within 6 years and are not currently enrolled, have a higher chance of becoming unemployed borrowers. And by definition, unemployed borrowers have no earnings so their total federal debt to annual income ratio is set to 100. During which time when noncompleters are unable to pay back loan, interest keeps accruing and accumulates into a massive burdensome. The longer period they remain unemployment, the higher their interests, the more likely they default or even fall into in serious delinquency. Adding on top of the burden, the Department of Education requires students who accepted grants prior to going to college then withdrew early from college to pay back a part or all of the portion(s) that they have/had not used. Withdrawal will haunt students and their families financially many years down the line.

Hence, it is of students, their families, and the society's interests to gain a better understand on what affects their persistence and performance in college. Erikson's Stages of Psychological Development claims that young adults, in their twenties to early forties, struggle to form close friendships and to gain capacity for intimate love, or they feel socially isolated[7]. Similar conclusion is reached by Astin who emphasizes that peers are the most important influence on undergraduates' performance[2]. Therefore, examining the impact of friendships on college students is a reasonable approach to appreciate the nature of their academic performance.

2. Methodology

To search for relevant literature, key words *undergraduate*, *grade point average*, and *number of friends* were used. AND function was implemented to search for articles with all of the relevant keywords only. For example, when *undergraduate* AND *grade-point average* was entered in the search bar, the articles that appeared were related to GPAs of undergraduates only, not the ones about GPAs of high schoolers, or eating habits of undergraduates. OR function was utilized to search for articles with similar-meaning key words, such as *college student* OR *undergraduate*, *academic performance* OR *grade point average*, *peer* OR *friend* OR *buddy*. Because there were very few articles appeared with the key word *number of friends*, the word *friendship* and its variances were used to broaden the scope. Furthermore, truncating (symbol *) was added after the search phrase to include a family of word that begins with that phrase. For example, when *friend** was searched, all articles with words *friend*, *friendship*, *friends*, etc. were appeared. Articles were searched for with and without symbol "", which signals to the search engine to find these exact phrases of words only, no more no less. A list of search engines relied upon was PubMed, PsycINFO, EBSCO, Embase, Web of Science, Google Scholar, Virginia Commonwealth University library, etc.

The subject was full-time undergraduates, preferred traditional undergraduates (age 15-25). Of all relationship, kinship and romantic relationship were excluded. Previous papers have been published estimating the amount of time it takes to make and maintain friendship, the positive impact of friendship on lessen stress, improve health and increase productivity. Although there are several authors have addressed the impact of friendship on undergraduates' academic performance, retention, and persistence, no one has examined both when friends are few and when friends are many and their impacts on undergraduates' performance at the same time. Hence, this paper was intended to review the literature from both ends, then suggest a hypothesis based on the review, and parameterize future study to test the hypothesis. The goal of this paper was not to introduce a new concept, but was rather an effort of quantifying existing yet abstract concepts such as friendship, social support, peer pressure, etc. into a value/variable that is numerical, important, and relevant to the undergraduate population, such as grade-point averages.

3. Review Of Literature

3.1 Benefits Of Friendships

Friendship is a "voluntary type of social relationship that encompasses intimacy, equality, shared interests, and pleasurable or need-satisfying interactions,"[3]. The criteria sharing interests of friendship is supported by many researchers[9,13,27]. Indeed, Robert and Dunbar claim that in order to preserve the intensity of friendships, the number of activities done together must be maintained[27]. One down side of this definition is that it does not specify the difference in intensity and emotional closeness among friends; in other words, best friends and acquaintances are both considered "friends."

There are multiple benefits of friends for college students. One of which is providing the rich source of valuable information. The information is inclusive, ranging from how to navigate college and where to buy the cheapest and most delicious food, to the comments about courses and professors and opportunities available on and off campus. Martínez Alemán emphasizes the importance of friendship and its function as a channel of information for female college students, "These college women saw their friendships as a relationship from which they could learn to navigate college terrain, and from which they could extract the information necessary to improve the chances for academic success. Their female friendships are practical and functional in that they serve as resources for effective skills: anticipating what the professor wants, setting workload priorities, and proofreading"[19]. Through collaboration, friendships offer students an opportunity to learn from their peers, including receiving feedback on their assignments, reflecting their performance, and sharing study tips, as noted by Light, "… students who study outside of class in small groups of four to six, even just once a week, benefit enormously"[17].

Friendship promotes undergraduates' welfare. Falci and McNeely finds an inverse relationship between the number of friends and depressive symptoms for adolescents (age from ten to nineteen, according to World Health Organization's definition) who have fewer than 12 friends[8]. In 2014, Mundt and Zakletskaia compares the peer status (number of friendship nominations received from others) of adolescents and reveals that adolescents with higher peer status in school experience significantly better health and lower healthcare costs over the next 5 years[20]. Similarly, Xie et al asserts that mental illness and unhealthy behaviors, such as depression, anxiety, uneasy feelings, and decreased well-being, are associated with fear of missing out and lack of friend support[35]. Individuals who experience fear of missing out often feel fearful and worried, thus their well-being is compromised. When individual's basic psychological needs are satisfied, they are more likely to feel that they have gained what is deserved, which could help boost well-being. Perceived friendship support is positively correlated with basic psychological need satisfaction, which in turn is negatively correlated with fear of missing out and therefore is negatively correlated with anxiety and depression. Anxiety and depression are in turn negatively associated with academic performance[33], and thus, friendship is positively correlated to academic performance.

Friendships also help with retention and persistence rate. According to National Student Clearinghouse Research Center, retention rate is the percentage of students who return to the same institution for second year, while persistence rate points to the percentage of students who continues college education for the second year at any institution, not necessary at the initial institution[23]. Tinto claims that, "An institution's capacity to retain students is directly related to its ability to reach out and make contact with students and integrate them into the social and intellectual fabric of institutional life"[31]. What pushes college students away from expressing their fullest potential and closer to abandoning their dreams is isolation. Isolation is the most severe during freshmen year because sense of attachment has yet to grow while the problems of adjustment, the rigor of curriculums and the burden of independence start to become discernable. Consequentially, retention and persistence rate are usually the lowest from first to second year of college[29]. During this sensitive transitional period, it is advantageous to experience the time with fellow friends and explore what the university offers in terms of academic and profession, support and wellness. The evidence that students who receive more support from family and friends tend to feel less lonely, and more likely to continue college education is also shown by Nicpon et al[24].

Possibly the most important benefit of friendship is easing the transition to college. Transition to college is a very exciting yet very vulnerable time for students. It is the time for students to say good-bye to their friends and families and are going to be exposed to a completely new environment in which there will be no one waking them up every morning or reminding them to do laundry, and for many of them, this is probably the first time in their life that they become completely independent. This uniqueness of experience poses some levels of stress on student. Cindy Liu, an assistant professor of pediatrics at Brigham and Women's Hospital, has once said that, "[Transition to college] is a phase of life where young people are confronted with expectations from new relationships and living situations and other encounters that are stressful." And freshmen are not the only ones who stress; 85% of all college students

reported experience stress on daily basis in 2009. The stress can intensify for upperclassmen who are going to enter workforce or compete for graduate school in near future[7]. Just like workers are negatively affected by the prolonged and severe stress as it is psychologically damaging and may hinder a person's ability to engage in effective behavior, long-term stresses compromise undergraduates' ability to achieve their educational goals, leading them to feel dissatisfied with their postsecondary education, which eventually leads to drop out of college[22]. Therefore, it is important not only for students but also for the institution to identify the stressors and ways to alleviate them. Besides the reasons of heavy work load and financial concerns, the most common sources of emotional stress for undergraduates are lack of confidence about oneself, feeling lonely, anxious and having no one to turn to and understand[6]. People feel lonely when they interact less with friends and family and receive less social support; hence, it is plausible to predict that these stressors can be moderated by the presence of friends, especially the ones who are in the same setting (i.e. university campus) and enduring the same situation. Since college students with few interactions with friends and family display more loneliness, more stress, are more likely to drop out and less likely to perform well, it is reasonable to hypothesize that college students who have adequate social support from their friends feel less stress, less likely to drop out and more likely to excel academically.

It turns out that a decent number of researches emphasize the importance of living in residential hall for providing opportunities for students to fabricate and diversify their networks of friends, especially for first-semester freshmen. Astin points out that living in a campus residence hall has a positive effect on students' satisfaction since many friendships arise from living in the same environment[2]. The importance of spending time talking with faculty outside of class and socializing with friends is emphasized due to its positive association with the willingness to reenroll in the same college. He claims that not only living away from home is positively related to overall satisfaction, but also as the distance between college from home increases, the loading on overall satisfaction variable becomes more significant. Rode et al argue that university satisfaction (i.e. setting, classroom experiences, etc.) alone is not significantly correlated to academic performance; however, overall life satisfaction, which includes satisfaction with university life, social life, friendships, leisure activities, etc., is a better predictor of performance than university satisfaction alone[28]. When cognitive ability, country of citizenship, and gender are controlled, overall life satisfaction significantly predicts GPA and assessment center ratings[28]. Rode et al also state that life satisfaction is in a way equivalent to happiness, and that the association between life satisfaction and performance is the same as the association between happiness and performance. Happiness, and so does life satisfaction, improves confidence, optimism in the approach to work, and more importantly, performance for a specific task and performance over[28].This statement agrees with the Nicpon et al.'s suggestion that students who live on-campus tend to have higher GPAs, more likely to persist in college and are better supported by family and friends, as they are more likely to readily access and utilize campus resources, thus tend to do better in class and have a higher GPA[24].

3.2 Costs Of Creating And Maintaining Friendships

Human networks are structured in 4 layers with different sizes: 5, 15, 50, 150, and are respectively named: support clique, sympathy group, affinity group, and active network[30]. Each of the layer relates to the former layer by a ratio of 3[30,15]. The classification is based on the frequency of contact, the support received emotionally and informationally, and sensitivity to decay. The contact rate per day is highest in the support clique, decreases significantly for the sympathy group, and continues to decline as the number of members within the layer increases, as shown in figure 1.
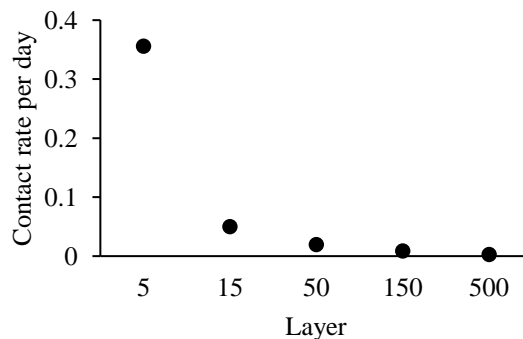

Figure 1. The mean rate of contact with friends per day at each layer of network[15]

The amount of time spent together is not consistent across the layers of the network. To calculate the average amount of time spent with friends in each layer, Sutcliffe et al take the mean contact rate and multiply by the sum of the numbers of friends in each layer and with the average time spent for each contact. If each relationship in every layer requires the same frequency of interaction as with support clique members, the total required social time would be 39.4 hours per day, which is impossible.

Each layer serves distinct functions. The support clique consists the fewest number of friends and intermediate family members, yet with whom the bonds formed are the strongest and most resilient. We rely on them for financial and social support. The sympathy group provides sense of protection and helps minimize stress. The support clique and sympathy group together make up a "close friend" classification, which is used in other researches[8]. These two groups consist of people who depend on us and whom we truly depend on. The affinity group and the active network function as information channels from which information is exchanged. One down side of Sutcliffe et al.'s work, at least for the purpose of this paper, is that the term "friend" used is inclusive, consisting of kin (genetically and affinity) and non-kin (i.e. best friends, romantic partners, coworkers, classmates, neighbors, etc.), according to Hall[13]. There is great difference between kinship and friendship. Roberts and Dunbar compare friendship and kinship against three criteria: cost of maintenance, decay, quality of relationship over time of separation, and establish that the sensitivity of friendships' emotional intensity to decrease in frequency of contact is greater than kinship[26]. In order to sustain at particular levels of emotional intensity, more maintenance in terms of time and effort is required for friendship.

However, time is a limit source and is incompressible. According to University of Michigan-Flint, for every one credit hour, approximately two to three hours outside of class preparing and studying is expected[32]. Depending on school, full time students can enroll from 12 to 20 credits in a semester. Hence, at the minimum, students are expected to spend 12 hours in class and 24-36 hours outside of class per week, or in other words, 36 to 48 hours a week are devoted into studying. At the high end, the amount of time is expected to be 60 to 80 hours per week. Additionally, Centers for Disease Control and Prevention recommends seven or more hours of sleep every night for adults age 18 to 60 years old[4]. Of the total of 168 hours a week, 85 to 129 or more hours are already used. The remaining 39 to 83 hours or fewer have to be distributed for extracurricular activities (i.e. volunteering, participating in clubs and organizations, playing sports, etc.), part-time job, personal care, household chores (i.e. laundry), maintaining family and social contact, etc. Having too many friends will eventually spread out the time available for the rest of the activities, including socializing with close and best friends, studying, etc., shielding the positive effect of close friendships and posing negative effect on college retention, persistence and performance.

The above claim can be supported by the cost versus benefit analysis of Sutcliffe et al[30]. Figure 2 shows that the function of cost variable is linear, while the function of benefit is asymptotic. Similar trends are observed for two other groups: affinity group and active network. From the trend, for any given group of friends, two conclusions are drawn as the number of friends increases: one, the time investment increases; two, there exists an asymptote at the upper bound of the benefit function so that the difference in benefit gets smaller than the previous one.
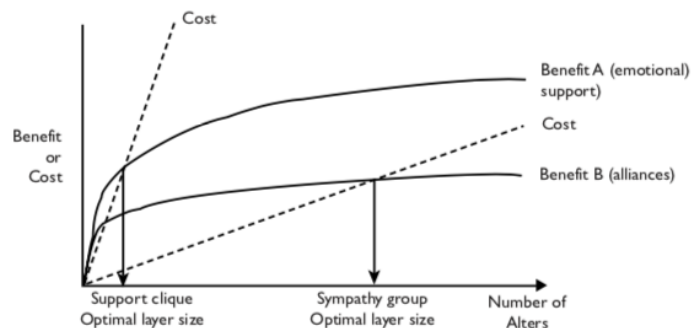

Figure 2. The model of cost of time and benefits of relationships with a variety of quality and quantity. The intersection of cost and benefit is the optimal number of friends for a particular relationship[30]

Friends' expectations increase as ones' number of friends increases, especially when they don't know each other, which will then put more pressure on the constraint of time. The probability that any two of a person's friends are friended with each other tends to fall between 10% and 50%[10]. Falci and McNeely provide evidence to show that the negative effect of too many friends becomes worse for adolescent girls whose friends mostly don't know each other, yet is worse for boys if his friends know each other[8]. Girls' mental health is compromised when her network of friends is fragmented because she is then obligated to fulfill her responsibility for each of her friends at different times.

However, the opposite is true for boys because they are less likely to experience peer pressures when their network of friends is not dense. In both cases, when social network is too large, social support can no longer mediate the ill effect of over-integration. Moreover, Falci and McNeely also point out that as the number of friends is over 12, the depressive symptoms associated with role strains increase, and when the number reaches 24, the depressive symptoms experienced is at the same level as having zero friends. However, when the number of friends is 12 or below, the depressive symptoms decline as the network size inclines. Since depressive symptoms negatively affect performance, experiencing the least depression will lead to better performance, opposite for the most depression. The small number of friends indicate that the term "friends" in this case refer only to close/best friend. This upper bound (12 to 24 friends) found by Falci and McNeely is close to the number that Dunbar proposes to be the number of members in support clique and sympathy group (the sum ranges from 11 to 20 friends)[26]. Although there is no exact maximum number of close friends one ought to have, the limit is predicted to be 20-24.
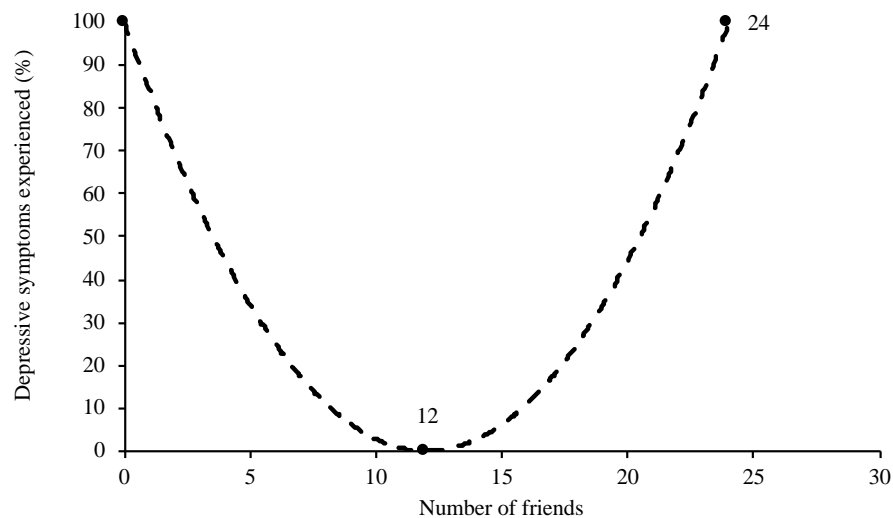

Figure 3. Suggesting model of association between number of friends and depressive symptoms experienced. Modified from Falci and McNeely's result[8]

The percentage in depressive symptoms experienced should not be interpreted literally, but rather as an illustration of how having too many or too few friends can be both detrimental to undergraduates' mental health. Similarly, 0% depressive symptoms shown at 12 friends does not mean that if students had exactly 12 friends, they wouldn't experience any depression; it only means that 10-12 friends would probably be the optimal number of close/best friends that adolescents have.

Furthermore, the limit in ability of brain to differentiate and coherently associate people with corresponding memories and feeling is one of the reason behind why there must be an upper limit on the number of friendships. Having to managing long-term relationships and complicated networks explains the bigger size of brains in primates[27]. The pattern that as the network of relationship gets wider and more complicated, the volume of the brain increases shows that at a particular volume of brain, there are only so many relationships that can be generated and maintained; relationships that are not currently needed are naturally degraded.

Compared to friendships initiated from the beginning of college, high school friends who no longer go to the same institution do not weigh as significant to undergraduates. Goguen, Hiester and Nordstrom claim that having an intimate relationship with new college friends is crucial to undergraduates' academic performance and that conflicts with new friends are detrimental to GPA of both Fall and Spring semesters during first year in college[11]. However, good relationship or conflicts with old friends from high school are not significant related to persistence from Fall to Spring semester[11]. This finding agrees with the conclusion of Roberts and Dunbar who state that friendship is likely to decay as time spent together decreases[26]. The underlying reason is because transition to college causes physical separation from old high school friends with whom the students are no longer attend the same school. This separation will create barrier and put pressure on students to spend extra effort if they chose to maintain the relationship[26]. The effort, in turn, will take away time spent on studying and meeting new people on campuses[17], thus reducing opportunity to develop sense of attachment to the new environment. Lack of attachment is detrimental and could potentially increase

the risk of attrition. As mentioned above, even the closest friendships requires active maintenance, in the forms of time and effort spent contacting and performing activities together, to prevent decay and maintain at a high level of emotional closeness[26]. In a longitudinal study, the length of relationship is not significantly correlated to the emotional closeness of participants[27]. Therefore, it is reasonable that high school friendship, after a period of non-socialization, becomes less important for undergraduates than college friendship.

4. Generation Of Hypothesis From The Review

Friendship is a vital aspect of college life because it supports undergraduates academically and socially, facilitates well-being, smoothens the transition to college, improves college and overall life satisfactions, and most importantly, enhances the retention and persistence rates and academic performance of undergraduates. However, when undergraduates have too many friends than they can keep up with, the benefits of friendship start to fade, and consequences of stretching oneself too thin are expressed in increasing depressive symptoms, decreasing emotional closeness with friends, and eventually lowering the rate of retention and persistence and worsening the performance. The hypothesis was that as the number of friends increases, undergraduates' GPA also increases, until the number reaches the upper limit, then GPA decreases. The upper limit, obtained from a limited source of literature, was set to be 20-24.

5. Suggested Parameters For Future Study To Test Hypothesis

As stated above, there is a limited number of articles that specifically test the effect of having too few or too many friends. Most of the articles focus on either the importance of friendships to college students or the possible side effect from friendships (i.e. peer pressure). A future study is thus necessary to understand the relationship between undergraduate's GPAs and their network sizes more comprehensively.

   Since a majority of graduate schools and companies prefer students with a 3.0 or higher GPA than students with a lower than 3.0 GPA, 3.0 can be a separation line between a high GPA and a low GPA. Or 2.0 is a fine separation as well, as in many universities, a C (2.0 in GPA) is required to take higher level courses or to maintain within certain programs. The suggesting classification of number of close/best friends: fewer than 10-12 close friends, too few; more than 20 close friends: too many; 10-20 close friends: optimum. However, there are limitations for using this model, Falci and McNeely investigate adolescents, not undergraduates, so there shall be caution in extrapolating the model to undergraduates. Also, Falci and McNeely only cover the category of close/best friend; to understand the friendship profile of undergraduates inclusively, a more broadly-applied model should be constructed.

   The parameters of the study (i.e. exclusion of romantic relationship, inclusion of all acquaintance levels in friendship, measurement of academic success using GPA system, etc.) should be tested as well. And depends on the scope of the study, the sample can be representative of undergraduates in a whole nation, or of a single state. Since it is unethical and quite impossible to "force" students to have friends or not have friends or to limit how many friends they can have, a combination approach of survey (to know students' network of friends, how happy or unhappy they are or have been in the last week/month/since college, their attitude toward studying, grading system, the university, etc.), observation (i.e. how social outgoing they are, how happy or energetic they appear, the concentration on the work at hand, etc.), and reports of grades would be prioritized. However, there are constraints and barriers to this approach. One such barrier comes from the difficulty of obtaining accurate grade reports, due to protection of privacy for students. There is a potential for bias if students are asked to voluntarily release their grades to researchers, as high-achievers are more likely to agree to do so. Identifying and addressing these potential issues is beyond the scope this paper, however.

6. Acknowledgement

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