Income and happiness in teaching: Understanding teachers' well-being using regression model and *K*-means clustering

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Abstract

The happiness of a teacher depends on some factors in the workplace including income and other benefits. This research paper examines the relationship between income inequality and happiness among college teachers. The study also aims to identify distinct clusters based on net income and happiness levels and explore their economic implications. The analysis involved secondary data from a current published study which were gathered through an adapted questionnaire from literature involving 101 college teachers. The gathered data were computed through statistical measures, regression analysis, and the *K*-means clustering method to make descriptions and draw conclusions. The results showed that, on average, faculty members are "happy" and with income relatively "low" based on Philippine standards. The regression analysis revealed that income and happiness are directly related but not significant association. Plus, the *K*-means clustering findings highlight the interconnections of income and happiness, with variations across clusters. Based on the significant Silhouette score of 0.631, the optimal number of clusters via *K*-means is 3. The three clusters represent the low, medium, and high levels of teachers' income and happiness. Cluster 1 represents few faculty with economically and emotionally well-off individuals, Cluster 2 depicts dominant faculty with lower income with high levels of happiness, and Cluster 3 faces challenges with lower income and happiness. Conclusively, income does not always influence the happiness of a college teacher. Hence, the research article strongly suggests that to improve the well-being of college teachers which is vital in quality teaching, the school heads must focus on professional development opportunities and incentives that compensate their efforts.

Keywords: College teaching, economics of happiness, income inequality, K-means clustering, the well-being of teachers

Introduction

Happiness refers to a positive emotion and contentment in life. According to Casinillo and Seriño (2022), happiness refers to subjective well-being that involves the condition of meaningful life and satisfaction. Happiness study is one of the controversial topics in social science, particularly in behavioral economics (Frey, 2020; Norton, 2020; Petrovič et al., 2021). It should be noted that happiness is directly related to job satisfaction and is more often dependent on economic income (Lim et al., 2020). In the study of Casinillo et al. (2021), it is mentioned that happiness in the workplace is defined as an individual who enjoys what he/she is assigned to and is associated with high work satisfaction as well as productivity. In other words, a happy worker does not think it is work but focuses on the goals and realizing how to be efficient and effective in the workplace. Kadoya et al. (2020) portrayed that if a worker is emotionally sound and happy, then he/she is more likely productive and a high performer. In that case, a predictor of happiness must be investigated to enhance the well-being of a worker and improve productivity at work. The findings of Lim et al. (2020) depicted that the income of a worker has a great influence on their happiness at work. This is supported by D'Ambrosio et al. (2020) that happiness is influenced by monetary compensation at work since they can buy what they need and it provides comfort.

Meanwhile, happiness in teaching is widely studied in literature wherein it provides a sound argument that the well-being of teachers motivates them to become competitive educators (Suissa, 2008; Tadić et al., 2013; Moskowitz & Dewaele, 2021). Although teaching is exhausting and challenging work, happiness makes the teacher motivated and think of it as a fulfilling life (Casinillo et al., 2020). Being a teacher does require hard work and dedication as a self-sacrifice to fulfill the effecting teaching-learning environment. According to Habibzadeh and Allahvirdiyani (2011), teachers' job satisfaction and income are directly associated. This indicates that teachers with high incomes are more fulfilling in their teaching careers because they have more economic advantages. In other words, the happiness of a teacher is positively influenced by their income which may serve as an aspiration in doing their job. In fact, Casinillo et al. (2020), and Moskowitz and Dewaele (2021) mentioned that if a teacher is happy, then they can promote a positive learning environment and make the class lively and enjoyable to students. On the face of it, happiness in the classroom environment can positively influence the learning process. In addition, the study by Ma and Ma (2021) stated that if a teacher receives more economic benefits and income from their job, their subjective happiness and productivity become stronger. However, it is found in other studies that income does not contribute to the happiness of a teacher but they are happy because of the job itself (Bilal & Kinza, 2020; Casinillo et al., 2020). Henceforth, the relationship between income and the happiness of teachers is an interesting subject to study especially in an unprecedented situation in the educational system.

Although income and happiness are widely studied and well-researched, the emphasis on college teachers during an unprecedented scenario, that is, the COVID-19 pandemic is scarce, particularly in the Philippines. Additionally, analyzing the income and happiness of teachers using a regression model accompanied by the *K*-means clustering method has never been done wherein it captures the economic implications at different levels. So, the main problem for this research study is to capture the effect of income on teachers' happiness at their work. Hence, this social study has been realized. In a general sense, this article aims to elucidate the association and economic implications of college teachers' income and happiness during the unprecedented situation. Specifically speaking, this research study sought the following goals: to describe the income and happiness levels of college teachers; to determine the relationship between income and happiness; and to cluster the different income inequality about happiness levels using *K*-means. The purpose of this study is to explain the influence of income on happiness in teaching during difficult situations during the pandemic. Results may provide new information about income inequality in the aspect of college teachers as a basis for policy-making procedures. The study also hopes to give argumentation in improving the teachers' well-being to avoid turnover intention during difficult times. Moreover, the study may suggest some insights on how to motivate teachers and improve their teaching strategies as well as maintain a healthy well-being at work. Furthermore, the article may serve as baseline information for college teachers and researchers, and contribute information to the topic of the economics of happiness particularly in teaching.

Conceptual framework

It is worth noting that income from teaching is an amount of money received in exchange for professional service. In that case, it is more likely happy is the teacher if the income is relatively high (Bilal & Kinza, 2020; Ma & Ma, 2021). In fact, money brings comfort and makes an individual economically competitive over others. Although teaching is a career of personal motivation, and known as occupational motivation, this does not mean that teachers are not influenced by their income. In a recent study by Fullard (2021a), it is depicted that teachers' income positively affects the teachers' well-being and motivates them to perform better in their job assignments. Consequently, a happy teacher performs better as opposed to an unhappy one and has a positive impact on their students' cognitive learning (Casinillo et al., 2020; Moskowitz & Dewaele, 2021). However, during the COVID-19 pandemic, teachers are experiencing an unprecedented situation, wherein most of them are burnout and facing stressful workplaces (Bravo et al., 2021; Abuhmaid, 2022; Bustillo & Aguilos, 2022). On the face of it, teachers' happiness or well-being in doing their work is diminishing and the turnover intention rate is increasing. In the recent paper of Fullard (2021b), it is stated that most teachers are less motivated to work because of the impact of the pandemic. As a result, it adversely impacted teaching effectiveness and negatively affected the students' learning environment. Hence, the conceptual framework of this study is to look into the variation of happiness in teaching during the pandemic through income as a driving force. The article's target is to elucidate the association between the two variables (income and happiness) and categorize them into clusters to further analyze the effect of income on happiness at different levels. Furthermore, the framework extracts economic implications as income level influences happiness in teaching.

Methods

Research design

This article utilized a descriptive-correlational research design in which it describes the variables of interest and determines the association between them. In that case, this study engaged standard descriptive measures that concise the income and happiness which is presented in tabular form. Additionally, the research study employed inferential statistics such as regression analysis and clustering methods to make forecasting and extracting useful economic implications that improve the well-being, motivation, and quality of teaching at the college level.

Respondents and data collection

Secondary data was utilized in this study from a current paper by Casinillo et al. (2021). The study dealt the subjective happiness and captured the influencing determinants affecting them using econometric modeling. The study's respondents are 101 college teachers at Visayas State University (VSU) during the COVID-19 pandemic. In that event, these teachers were facing various challenges as they faced the modular and online learning procedure which caused them stress and burnout. In that case, happiness in teaching is an interesting variable for this matter. The study by Lim et al. (2020) stated that happiness is controversially affected by their income. However, the previous study does not focus on the controversial issue of happiness and income which raises debates in the study of the economics of happiness. Hence, the variables used in this current study are the income of college teachers and their corresponding happiness levels gathered through a developed survey questionnaire. The monthly net income of college teachers was then collected and categorized in Table 1.

Table 1

Monthly Income Category

Category	Monthly income
High	63,701 PHP and above
Middle	36,401 PHP to 63,700 PHP
Low	36,400 PHP and below

Note. Adapted from *Poverty, the Middle Class and Income Distribution Amid COVID-19*, by J. R. G. Albert, M. R. M. Abrigo, F. M. A. Qiumba and J. F. V. Vizmanos, 2020 (https://www.pids.gov.ph/publication/discussion-papers/poverty-the-middle-class-and-income-distribution-amid-covid-19)

As for the happiness level of the college teachers, an adapted questionnaire constructed was based on the paper of Lyubomirsky and Lepper (1999) which measures subjective happiness at work in the form of a 10-point rating scale. The instrument consisted of three items questions about the teachers' happiness in teaching during the pandemic and was found to be reliable based on Cronbach's alpha which is equal to .86 (Cronbach, 1951). This current study dealt with the mean average happiness score and Table 2 shows the happiness interval scores and their linguistic classification.

Table 2

Happiness Score and Its Classification

Happiness score	Happiness classification
8.21 – 10.00	Very happy
6.41 – 8.20	Happy
4.61 – 6.40	Neutral
2.81 – 4.60	Unhappy
1.00 – 2.80	Very unhappy

Note. Adapted from "Economics of Happiness: A Social Study on Determinants of Well-Being Among Employees in a State University," by L. F. Casinillo, E. L. Casinillo and M. R. K. L. Aure, 2021, *Philippine Social Science Journal, 4*(1), p 42-52 (https://doi.org/10.52006/main.v4i1.316). CC BY-NC 4.0

Data analysis and empirical model

The collected data were then formatted in Microsoft Excel and underwent clearing, that is, missing data and outliers are removed in the analysis. In summarizing the income and happiness of college teachers, a tabular form consisting of statistical measures that include mean (*M*), standard deviation (Std dev), minimum (Min), and maximum (Max) were presented. As for the association of income and happiness level, Pearson product correlation (r_p) was computed and regression analysis was constructed to capture the increase or decrease of happiness level concerning income. The empirical model is given as follows

$$Happiness_i = a_1 + a_2 \log (income)_i + e_i \qquad (1)$$

where $Happiness_i$ refers to the college teachers' happiness in teaching (scale of 1 to 10), $\log (income)_i$ refers to the normalized net income (logarithm based 10), $i = 1, ..., 101$ college teachers, a_1 and a_2 are the parameters to be estimated and e_i is the remaining random error in the model (1). The interpretation of the positive (or negative) parameter a_2 is that for every 1% increase in income, there is a corresponding increase (or decrease) in the happiness level by $a_2/100$. Moreover, the graphs (with actual income and normalized income) of the scatter plot were presented with the corresponding regression line fit. To construct the correlation and regression, STATA version 14.0 was used and tested at a 1% and 5% level of significance. To cluster the 101 college teachers of VSU in terms of their net income and happiness level, the *K*-means clustering method was employed. A *K*-means clustering is a statistical method that targets to partition n $\{x_1, x_2, ..., x_n\}$ observations to K (where $K \leq n$) clusters $\{S_1, S_2, ..., S_K\}$ and each cluster possesses observations with statistically the same characteristics, that is, observations are of the nearest cluster centroid (Likas et al., 2003). In this case, the *K*-means clustering method minimizes the variances or the squared Euclidean distances within clusters. The *K*-means clustering analysis was computed using two statistical software namely Orange software and Minitab 16. Orange software was used to determine the optimal number of clusters based on the highest Silhouette scores and to visualize the scatter plot with associated clusters. Furthermore, Minitab 16 was utilized to provide additional information on the identified clusters.

Results and discussion

Descriptive statistics and correlation

Table 3 depicted that, on average, college teachers are "happy" (*M* = 7.73, *SD* = 1.54) teaching despite the challenges encountered during the pandemic. In the paper of Farah Perwitasari et al. (2021), teachers were happy with online learning during the pandemic since they experienced the flexibility of time schedules. Moreover, the table below shows that the lowest happiness rating is 2 which can be interpreted as "very unhappy" and the highest is 10 which can be interpreted as "very happy". The average net income is close to 32,298 PHP (*SD* = 30,3341 PHP) ranging from 5,000 PHP to 219,000 PHP (Table 3). According to the income classification in the study by Albert et al. (2020), college teachers' income is considered "low". Additionally, Table 3 revealed that the Pearson correlation results (r_p = .142, *p* = .156) showed a positive, however, non-significant association between income and happiness in teaching. It is worth noting that happiness is not all about economic prosperity but the condition of meaningful experience in life and job satisfaction (Helliwell et al., 2020; Casinillo, 2022). Hence, in this result, it is suggested that teachers' happiness is not based on monetary compensation but on job satisfaction and how rewarding is their profession.

Table 3

Descriptive statistics and correlation for income and happiness

Variables	*M*	*Std Dev*	Min	Max	Interpretation[a]	r_p
Happiness score[b]	7.73	1.54	2	10	Happy	0.142*
Net income[c]	32298	30341	5000	219000	Low	

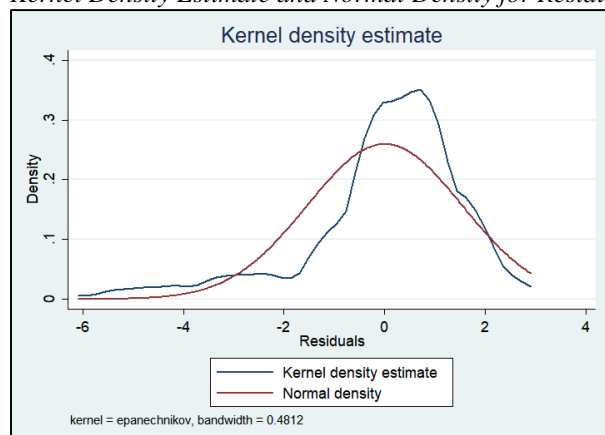*Note*. [a]See Table 1 or 2; [b]1 to 10 scaling; [c]In Philippine Peso (PHP); *p > .10

Regression model

By the Breusch-Pagan test, it is depicted that the regression model is not heteroscedastic (X^2 = .05; p = 0.82). This implies that the variances of residuals of the model are constant and known as homogeneity of the variances

(Durlauf, 2005). However, the residuals are not normal based on the results of the Shapiro-Wilk W test ($W = 0.864$, $p < 0.001$). The figure below shows that the Kernel density estimate is far from the normal density graph.

Figure 1

Kernel Density Estimate and Normal Density for Residuals

Based on the F-test, the regression model is not significant at the 5% level and the coefficient of determination is only 0.015. This means that income has a small influence on the happiness of teachers during the pandemic. The regression model revealed that for every 1% increase in income, there is a corresponding increase of 0.0075 in the happiness level in teaching. This implies that the regression line has a positive slope (See Figures 2 and 3). However, this increase is not statistically significant ($T=1.24$, p-value=0.216). Hence, the results indicate that teachers are just happy working and do not mind the monetary benefits. In addition, findings suggested that the happiness of a teacher is governed by other determinants aside from their income. According to Tadić et al. (2013), and Bilal and Kinza (2020) teaching is a profession that is satisfying as the teacher influences their students despite of relatively small income as opposed to another job.
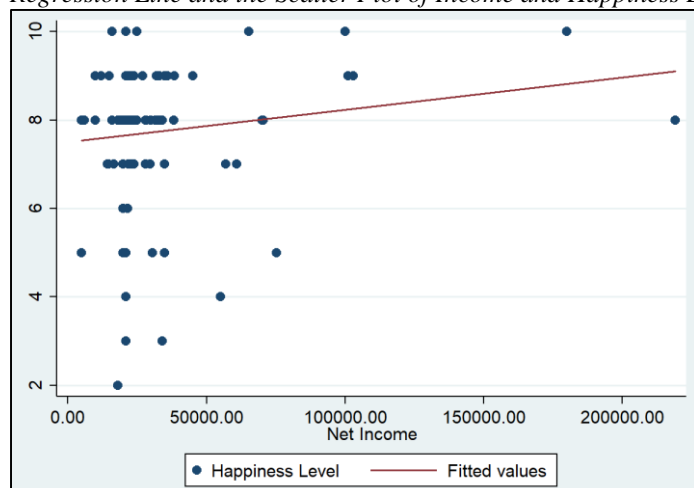
Table 4

Regression Analysis for Income and Happiness

Dependent: Happiness[a]	Coefficient	Std Error	t-test
log (net income[b])	0.746	0.600	1.240[*]
Constant	4.437	2.653	1.670[**]
R^2		0.015	
F-test		1.550[*]	

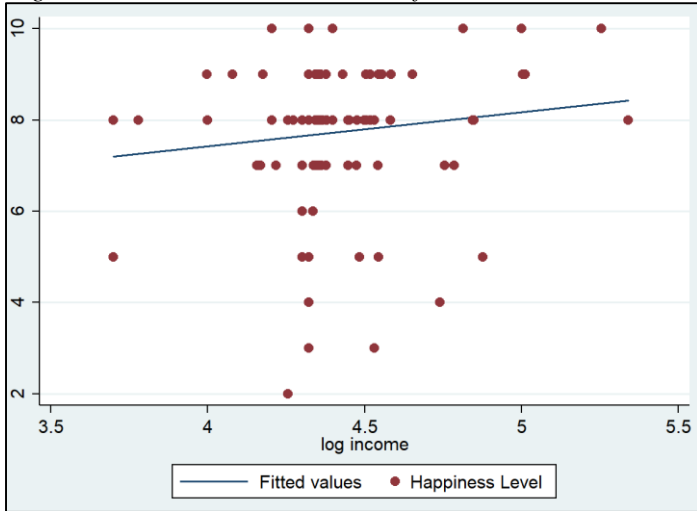*Note.* [a]1 to 10 scaling; [b]In Philippine Peso (PHP); [*]p > .10, [**]p > .05

Figure 2

Regression Line and the Scatter Plot of Income and Happiness Level

Figure 3

Regression Line and the Scatter Plot of Normalized Income and Happiness Level

K-means clustering

The k-means clustering method was applied to the data set, resulting in the identification of three distinct clusters. Figure 1 shows that the optimal number of clusters is three, based on the significant Silhouette score of 0.631. This implies that the college teachers from VSU can be classified into three clusters namely Cluster 1 (High), Cluster 2 (Middle), and Cluster 3 (Low) as depicted in Figure 4.
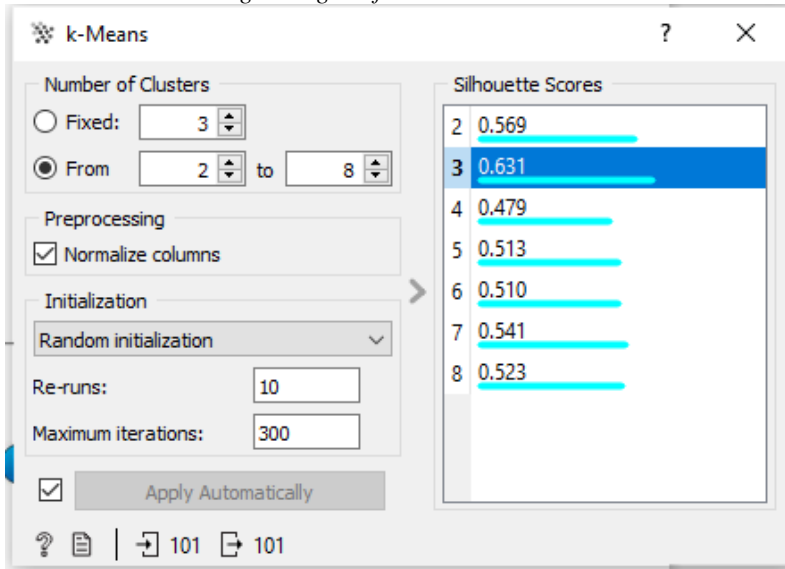
Figure 4

Silhouette Scores using Orange Software

Table 5 shows the three different clusters of college teachers, the first cluster represents the faculty members with high income (*M*=140600, *SD*=55518) and high levels of happiness (*M*=9.20, *SD*=0.84). However, there only a few (4.95%) of the teachers belong to the first cluster. The second cluster represents higher happiness (*M*=8.45, *SD*=0.64) in teaching and lower income levels (*M*=25829, *SD*=12011), and this second cluster has the highest number (65.35%) of teachers. The third cluster consisting of 29.70% of teachers is of lower income (*M*=27768, *SD*=15312) and happiness level (*M*=5.90, *SD*=1.49). The results of *K*-means clustering supported the findings of correlation and regression analysis above that income has a positive non-significant influence on happiness in teaching. As can be seen in Figure 5, cluster II has the dominant teachers who are happy with teaching even if they have a small income. This implies that teachers are happy working and doing their responsibility as professionals during the pandemic without even thinking of a higher monetary exchange for their efforts. This

finding is parallel to the result of the study of Bilal and Kinza (2020), and Casinillo et al. (2021), that happiness in teaching is not governed by their income but teachers are just really satisfied with their job which they found rewarding. Likewise, Benevene et al. (2019) portrayed that teachers find their happiness to their students' improved performance, newly developed skills, and academic success.

Table 5

Descriptive Statistics within the Clusters

Cluster	Descriptive measures	Happiness[a]	Income[b]
I (High cluster)	M	9.20	140600
N=5	Std dev	0.84	55518
	Min	9	100000
	Max	10	219000
II (Middle cluster)	M	8.45	25829
N=66	Std dev	0.64	12011
	Min	8	5000
	Max	10	70474
III (Low cluster)	M	5.90	27768
N=30	Std dev	1.49	15312
	Min	2	5000
	Max	7	75359

Note. [a]1 to 10 scaling; [b]In Philippine Peso (PHP).

Figure 5
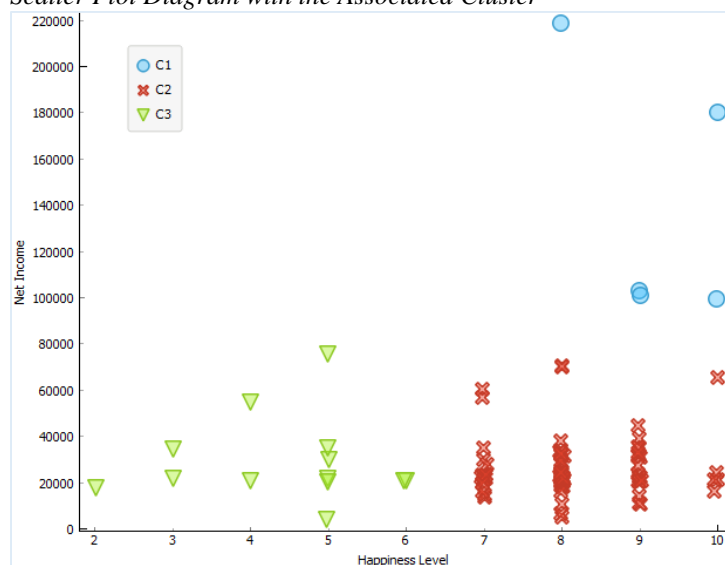
Scatter Plot Diagram with the Associated Cluster

Table 6 presents the summary statistics of the cluster analysis, including the number of observations, within-cluster sum of squares, average distance from the centroid, and maximum distance from the centroid for each cluster. The analysis revealed that Cluster 1 contained 5 (4.95%) observations, Cluster 2 consisted of 66 (65.35%) observations, and Cluster 3 comprised 30 (29.70%) observations. The within-cluster sum of squares, which measures the variability within each cluster, was the lowest for Cluster 1 (14.787), followed by Cluster 2 (21.353) and Cluster 3 (34.494). The average distance from the centroid was lowest for Cluster 2 (0.487), indicating a higher level of similarity among its members.

Table 6

Final Partition

Cluster	Number of Observations	Within cluster Sum of squares	Average distance from centroid	Maximum distance from centroid
I	5	14.787	1.630	2.719
II	66	21.353	0.487	1.649
III	30	34.494	0.949	2.539

   To further understand the characteristics of each cluster, Table 7 presents the cluster centroids for the variables included in the analysis namely happiness level and net income of college teachers. The grand centroid represents the overall average of all the observations in the dataset. The cluster centroids represent the average values of the variables within each cluster. For the happiness level variable, Cluster III had a negative centroid value (-1.1835), indicating lower levels of happiness compared to the grand centroid. Cluster I had a positive centroid value (0.9476), suggesting higher levels of happiness. Cluster II fell in between with a centroid value of 0.4662. Regarding the net Income variable, Cluster I exhibited the highest centroid value (3.6066), indicating relatively higher income levels. Cluster III had the lowest centroid value (-0.1435), representing lower income levels compared to the grand centroid. Cluster II, with a centroid value of -0.2080, was closer to the overall average income.

Table 7

Cluster Centroids

Variable	Cluster I	Cluster II	Cluster II	Grand centroid
Happiness score[a]	0.9476	0.4662	-1.1835	0.0000
Net income[b]	3.6066	-0.2080	-0.1435	0.0000

Note. [a]1 to 10 scaling; [b]In Philippine Peso (PHP).

   Table 8 displays the distances between the cluster centroids to assess the separation between the clusters. Larger distances suggest greater dissimilarity between clusters. The distances between the cluster centroids revealed interesting patterns. Cluster 3 and Cluster 1 exhibited the highest distance of 4.3134, indicating significant dissimilarity in both income and happiness levels. This suggests that individuals in Cluster 3 and Cluster 1 belong to distinct groups based on their economic and well-being characteristics. Cluster 3 and Cluster 2 had a distance of 1.6510, indicating moderate dissimilarity. Although not as distinct as the difference between Cluster 3 and Cluster 1, there were notable disparities between the income and happiness levels of individuals in these clusters. Cluster 1 and Cluster 2 demonstrated a distance of 3.8448, implying a relatively high level of dissimilarity. This suggests that individuals in Cluster 1 and Cluster 2 have distinct profiles in terms of income and happiness.

Table 8

Distances between Cluster Centroids

Cluster	Cluster 3	Cluster 1	Cluster 2
I	0.0000	4.3134	1.6510
II	4.3134	0.0000	3.8448
III	1.6510	3.8448	0.0000

   The distances between the cluster centroids support the notion that the *K*-means clustering method successfully identified distinct groups based on income and happiness levels. The clusters represent different segments of the college teachers from VSU, each with unique characteristics. Cluster 1, characterized by higher income levels and higher happiness levels, stands out as a group that may be economically and emotionally well-off. On the other hand, Cluster 3, with lower income and lower happiness levels, represents a group that may face economic and well-being challenges. Cluster 2 falls between the two extremes, indicating a moderate level of income and happiness. These findings align with previous studies that have shown a relationship between income and happiness (Liao, 2021; Zhu et al., 2021; Casinillo & Seriño, 2022; Luo, 2022). It is well-established that higher income tends to be associated with higher levels of happiness and well-being (Perez-Truglia, 2020). However, this relationship is not always straightforward, as other factors such as personal circumstances, social support, and individual values can influence the happiness levels of individuals (Bilal & Kinza, 2020; Kudrna & Kushlev, 2022). The cluster analysis provides a more nuanced understanding of the relationship between income

and happiness by revealing distinct subgroups within the HEI faculty population. The study by Mertoglu (2018) portrayed that happiness in teaching varies in regard to income bracket indicating that teachers have different views in economic and educational perspectives.

Conclusion

The main goal of this paper is to elucidate the relationship between income inequality and happiness in teaching. The results showed that, on average, income has a small and positive effect on happiness in teaching, however, not statistically significant. In addition, *K*-means clustering revealed that the dominant college teachers are classified as happy with a lower income. This implies that income does not always motivate a teacher to be happy in doing their work but they are happy because they are satisfied and motivated in their vocation. The findings have practical implications for policymakers and organizations. By identifying different segments of the college teachers' population based on income and happiness levels, targeted interventions and support can be developed to address the specific needs and challenges faced by each cluster. For example, Cluster 3 may benefit from financial assistance programs or professional development opportunities to improve their income and well-being. Cluster 1, on the other hand, may require strategies to sustain and enhance their already favorable economic and happiness levels. In conclusion, the *K*-means clustering analysis successfully identified distinct clusters within the college teachers from VSU based on their net income and happiness levels. The clusters exhibited variations in income and happiness, highlighting the heterogeneity within the population. The findings contribute to the understanding of the economic implications of income on happiness and provide valuable insights for policymakers and organizations in developing targeted interventions. Conclusively, the school heads may provide additional incentives or bonuses that compensate for their work hours and achievement, and regulate their level of workload to avoid stressful environments and increase happiness. It is worth noting that happiness leads to healthy living that increases work productivity. Moreover, the right amount of salary and incentives will improve the motivation and professional performance of teachers which makes them effective educators and competitive endeavors. Future research can further explore the underlying factors contributing to the differences in income and happiness levels among the identified clusters and assess the long-term impact of interventions on improving the well-being of faculty members.

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