

Can a score for study group dynamics in the first semester predict student retention?

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At ETALEE 2023 the authors will conduct a 90 minute hands-on session where a further introduction to the science behind psychological safety will be presented. A round table discussion focusing on explanations of student drop-out and institutional strategies to increase student retention will be facilitated.

Keywords

Psychological safety, student retention, learning environment, group and team dynamics

Background

A trustworthy work environment is key in retaining employees. Recent years have presented research from many social science faculties focusing on how to create a trustworthy workspace and many leadership education programs are likewise including this area in their curriculum (Edmondson et al. 2014; Newman et al. 2017)

Our aim is to investigate whether trustfulness can be applied to retainment of students at higher engineering programs as well. Students at our programs are from the very beginning of their studies placed in study groups. These groups create a group dynamic that to a certain degree establish the degree of trustfulness of each group. A high degree of trustfulness of the study group will impose a positive learning environment (Tsuei et al. 2019), and our question is whether it also might help retain students that potentially are in risk of attrition.

At the bachelor program in Technology Management and Marine Engineering students are in the very beginning of the first semester placed in study groups. Each group consists of 4-6 students. During the first semester each group will be coached and receive advice on how to obtain a better study environment and support each group member. These sessions can have focus on how to solve conflicts, how to organise weekly study meetings and how to rehearse for the exam.

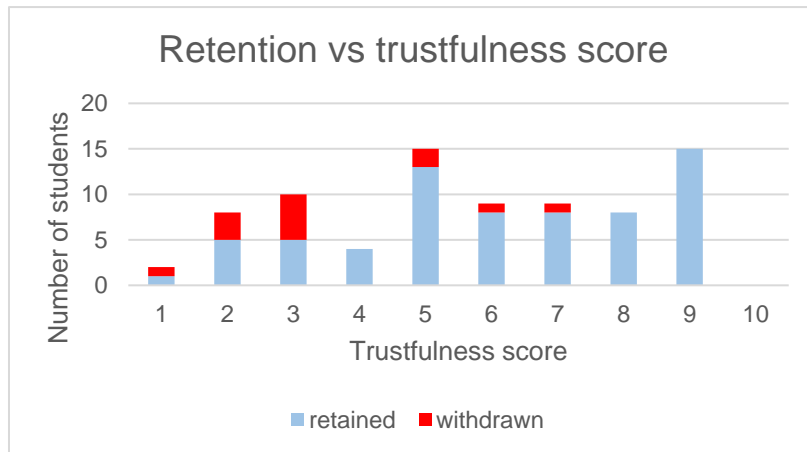
In the spring term 2022 the author was performing these coaching sessions at Copenhagen School of Marine Engineering and Technology Management. Parallel with the coaching each study group was given a score. The score indicated, on a scale from 1-10, the trustfulness within the group.

The overall score of trustfulness were based on three elements. 1) The verbally formulated level of trust, ambience and fellowship. 2) The degree of willingness to engage in social risk taking within the group. 3) The non-verbal communication between group members during the session.

The breakdown of the overall score into the 3 sub-elements has not been validated.

Statistical analysis

From mere observation, it seems there could be a significant correlation between a student's trustfulness score and the probability of that student still being enrolled one year later.



We therefore wish to explore if the trustfulness score can predict the retention status of a student approximately 1 year later.

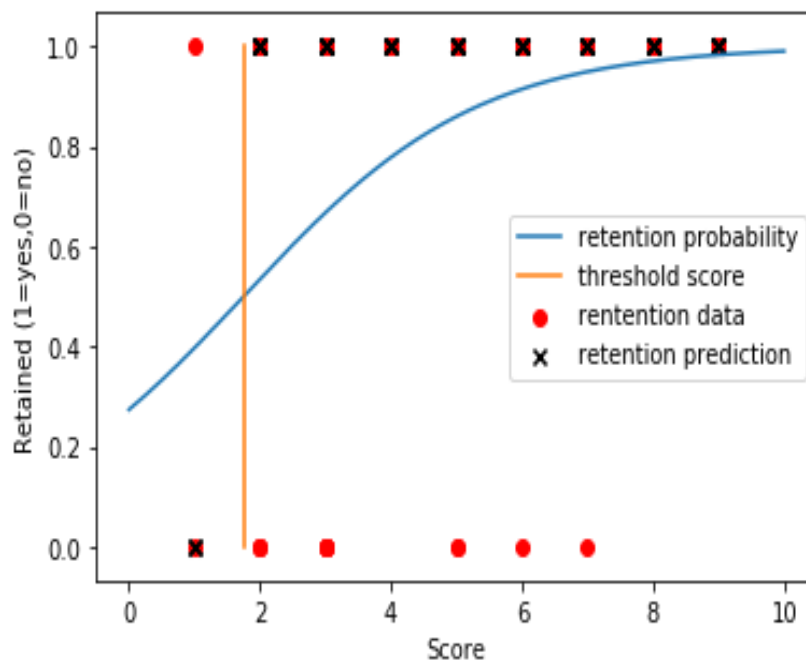
To this end, we perform a binomial logistic regression with the score as explanatory variable and retention status (1=retained, 0=withdrawn) as the response variable. The model is

$$p(x) = \frac{1}{1 + e^{-(\beta_0 + \beta_1 x)}}$$

Where x is the trustfulness score and $p(x)$ is the probability that a student is enrolled one year later.

The model is fitted to the data using maximum likelihood estimation. This is carried out using the Python statistics package *statsmodels*.

The result is shown below:



$$p(x) = \frac{1}{1 + e^{-(-0.9753 + 0.5574x)}}$$

Logit Regression Results						
Dep. Variable:	y		No. Observations:	81		
Model:	Logit		Df Residuals:	79		
Method:	MLE		Df Model:	1		
Date:	Mon, 06 Mar 2023		Pseudo R-squ.:	0.2045		
Time:	21:16:40		Log-Likelihood:	-28.382		
converged:	True		LL-Null:	-35.680		
Covariance Type:	nonrobust		LLR p-value:	0.0001333		
	coef	std err	z	P> z	[0.025	0.975]
const	-0.9753	0.755	-1.292	0.196	-2.455	0.504
x1	0.5574	0.173	3.225	0.001	0.219	0.896

As it turns out, the parameter β_1 (named x_1 in the print out) is significant with a p-value of 0.001, and so retention and trustfulness score are significantly correlated. However, the explanatory power of the score is not overwhelming given that the coefficient of determination is merely 0.2045.

According to the model, students who score less than $\frac{-\beta_0}{\beta_1} = 1.75$ have less than 50% probability of being enrolled in the program after one year, i.e. one may regard 1.75 as a threshold score.

The confusion matrix is presented below:

$$\begin{bmatrix} \text{True neg} & \text{False pos} \\ \text{False neg} & \text{True pos} \end{bmatrix} = \begin{bmatrix} 1 & 12 \\ 1 & 67 \end{bmatrix}$$

So the model makes wrong predictions in $13/81 = 16\%$ of the cases. Notice however, that the data is *not* linearly separable, i.e. no choice of model parameters would render the model capable of correctly predicting all data points.

Conclusion

We wanted to investigate whether a high degree of trustfulness in the study group would imply a higher chance of student retention. As shown in the previous section the difference in student retention between groups with a low trustfulness and high trustfulness is statistically significant. Of course, at this stage the causal mechanism as to why the retention is higher is not clear. There might exist an unobserved characteristic which leads to both low trustfulness and a high likelihood of student drop out. Further studies will have to investigate this.

Nevertheless, risk taking and non-verbal communication together with the study groups' out-spoken degree of trust and fellowship are assumed to indicate trustfulness. By using this score, either on study groups or on each individual student, at the beginning of the first semester, it possible for university colleges to get the necessary information to be able to intervene in time. From a societal perspective it makes sense to intervene in order to help the student find another relevant education which is better suited for the individual student's capabilities and desires.

Reference

Edmondson AC and Zhike L. "Psychological Safety: The History, Renaissance, and Future of an Interpersonal Construct." Annual Review of Organizational Psychology and Organizational Behavior 1 (2014): 23–43.

Newman A, Donohue R and Eva N: "Psychological safety: A systematic review of the literature". Human Resource Management Review 27 (2017): 521-535.

Tsuei SH, Lee D, Ho C, Regehr G and Nimmon L: "Exploring the Construct of Psychological Safety in Medical Education". Academic Medicine 94 (2019) 28-35.