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IMPLICIT THEORIES OF INTELLIGENCE: THE IMPACT OF INCREMENTAL MINDSET INTERVENTION ON STUDENT'S ACHIEVEMENT GOALS

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Abstract:

The achievement goal approach has led to educational and social-psychology as a foundation of practical education in schools. The implicit theory of intelligence, which is one of the leading models in motivation, is deep-rooted in goal theory. This theory suggests the student's belief system is divided into an entity and incremental mindset, which links each with a specific goal orientation: learning, performance, learning avoidance, and performance-avoidance. Therefore, the implicit theory of intelligence is considered an antecedent of achievement goals, which means that by changing the student's mindset, their goals and achievement levels will also change. This study investigates the effect of an incremental mindset intervention on student's achievement goals through a quasi-experimental design. For this purpose, a population of fifty-five eighth-grade female students was classified into control and experimental groups. Both groups performed the pre-, post-, and follow-up tests of goal orientations. The two-way repeated measures of MANOVA results showed a statistically significant difference in the impact of the applied intervention on student's goal orientation between the tested groups against time (F=5.585, P<0.001, η2=0.100).

Keywords:

Incremental Mindset Intervention; Learning Goal; Performance Goal; Learning Avoidance Goal; Performance-Avoidance Goal

Introduction

Several theories of educational psychology have been developed and attempt to explain how and why some students are motivated while others with the same ability do not? What psychological procedures assist students in flourishing in expose to obstacles? Over the past decades, one motivational model has been developed to response these questions which suggest student's core beliefs can set up diverse models of response to challenge and setbacks (Blackwell et al., 2007; Dweck, 2006; Dweck et al., 1995; Dweck & Leggett, 1988; Dweck & Sorich, 1999; Henderson & Dweck, 1990).

The groundwork and history of student's implicit theory of intelligence are deep-rooted in goal theory (Dweck, 1986; Dweck & Leggett, 1988). In the original goal models, two classes of goals were classified, including performance and learning goals. The purpose of performance goal is to endorse one's ability or avoid validating a lack of ability, and learning or mastery goals, where the aim is to obtain new knowledge or skills to enhance one's ability (Dweck & Elliot, 1983; Grant & Dweck, 2003). Research showed that children who adapted a growth mindset theory (e.g., smartness is something you can enhance as much as you want to) were considerably more eager to implement learning goals on an experimental task (e.g., "Hard, new, and different so I could try to learn from them"). In comparison, the children who adapted the entity mindset theory (e.g., You can learn new things, but how smart you are staying quite same as before) were more incline to hold a performance goal (e.g., "Fun and easy to do, so I would not have to worry about mistakes") (Bandura & Dweck, 1985; Dweck & Leggett, 1988).

Dweck (1986), labelled students who hold an implicit belief that ability is a fixed state as entity theorist and those who implicitly believe that ability is a malleable trait as an incremental theorist. According to this theory, student's mindset towards intelligence is significant predictors of other important variables like their goal orientation. Goal orientation theory as one of the leading perspectives in the study of motivation initially focused on the behaviour patterns linked with a given orientation. Dweck and Leggett's (1988), focused on goal orientation as a disposition characteristic that affects young children in educational contexts and reflects an enduring behavioural feature. This theory claims that changing student's self-theories can lead to a consequence of changes in their motivation, behaviour, and goals. It is hypothesized that performance goals, which focus individuals on the sufficiency of their level of ability, will make them exposed to the helpless response in the face of failure, making low ability attributions, negative affect, and reduced performance. In contrast, it is supposed that learning goals, in which individuals focus on improving their ability over time, will enhance the mastery-oriented response to challenge with strategy making, positive affect, and continuous performance. They offered the goals approach to an achievement motivation pattern, whereby the goals tell how one perceives and respond to challenges (Dweck and Leggett, 1988; Elliot & Dweck, 1988).

Researchers now use various terms for two goals: performance goals are sometimes called ability goals, ego-involved goals, normative goals and learning goals, also called mastery goals or task goals (Dweck, 1991). The theory is based on the idea that individuals adopt implicit goals, or goal orientations when faced with a task: the goal to look good as compared to others, and the goal to learn, to improve skills, or to gain knowledge (Ames & Archer, 1988; Dweck & Leggett, 1988; Dweck & Sorich, 1999; Kaplan, 2004).

Moreover, in a series of studies, Grant and Dweck (2003), found that students with learning goals maintain intrinsic motivation and performance despite the difficulty. However, individuals who had performance goals experienced a loss of motivation and demonstrated common helplessness after facing a challenge. Helpless children also found to have had more failure than what they had, and it is predicted that a large amount of the failures is due to tasks they need to redo. As a result, they will become disappointed because of the failures met and therefore lose interest in carrying out the task. These children show various emotions like sadness, anxiety, and defiance strategies to slow down after failure. Thus, students' future performance can be influenced mainly by how they attribute the cause of their (weak) performance (Grant & Dweck, 2003; Heyman & Dweck, 1992). According to Urdan & Schoenfelder (2006), performance-avoidance goals are usually linked with a negative model of motivational beliefs and behaviours. For example, students with performance-avoidance goal orientation are more prone to give up in face with difficult work or threatened with failure. They are less eager to take help from others and more at risk of self-defeating behaviours like self-handicapping. They may purposely create barriers that undermine successful performance on supposed significance tasks (Urdan & Schoenfelder, 2006). An essential issue in the achievement motivation field is to analyse why children do not like challenging tasks and surrender in problematic situations. Such a situation arises when students do not give enough time and energies to tackle challenging situations and give up before attaining their goals (Dweck, 1989; Heyman & Dweck, 1992).

Some studies concerned the role of student's beliefs as mediators of the relationships between implicit theories and achievement goals. Study of Chen and Pajares (2010), typically found a weak direct relationship between implicit theories and achievement goals while in a meta-analysis of 113 empirical studies, Burnette; et al., (2012) concludes that incremental mindset correlates negatively with performance goals and positively with learning goals. However, these correlations are not very strong to moderate in enlargement (Burnette, O'boyle, VanEpps, Pollack, & Finkel, 2013). Chen and Wong (2015), and Wang and Wolters (2017) support a positive association between performance-approach goals and academic achievement by demonstrating the mediating role of performance-approach goals in the relationship between incremental beliefs and school performance in the Chinese cultural context. In contrast to most Western samples results and inconsistency with past research among Chinese students, the results revealed that in Chinese students a stronger belief in incremental theory is associated with a greater tendency to adopt performance approach goals. It seems like these beliefs operate similarly in the too contrasting cultural setting while Chinese educational contexts are generally highly competitive and exam-oriented (De Castella & Byrne, 2015b; Hong et al., 1999; Chen & Wong, 2015; Wang and Wolters., 2017).

Since 1990 studies investigate the goal orientation that either manipulated and treatment group members to represent one's orientation (e.g., Butler, 1987; Elliott & Dweck, 1988; Utman, 1997). In comparison, many researchers (e.g., VandeWalle, 1997) considered goal orientation as a stable disposition and motivational trait reflecting relatively stable behaviour patterns. As a trait, it is also suggested that goal orientation be assessed, not manipulated (Butler, 1987; Elliot & Dweck, 1988; Utman, 1997; VandeWalle, 1997). In an experimental design, Anderman, Maehr, and Midgeley (1999) demonstrated that the schools could change their policies and practices to foster the development of students' personal mastery goals in students (Anderman et al., 1999; Fredricks et al., 2011).

In line with the goal literature research, the current study aims, to find out if student's goal orientation could change trough an incremental mindset intervention. With an incremental mindset students are more eager to set the goals that endorse learning and ability growth. In contrast, students with an entity mindset would be less likely to set the goals that oriented in the effort and growing. This study also aims to offer a low-cost and straightforward intervention applicable in many regular school schedules. Many students can receive the message and benefit from the promised achievement background through this kind of workshops. As such, this study primarily investigates the usefulness of the incremental mindset intervention on the target population. It is noted by Yeager and Walton (2011) as necessary to create a well-specific and theoretical base design for a particular context and population in hand. Also, according to Leonardi & Gialamas (2002), "More international and cross-cultural research is required to clarify the differences between our results and those of previous research" (Ahmavaara & Houston, 2007; Leonardi & Gialamas, 2002).

Method

Participants and Procedures
The population of this study is a female, state secondary schools in Kerman_Iran. Data were collected from two classes a total of 55 grade eight students (age 13-14), including experimental group (n=29) and a control group (n=26) located in a state secondary, single-sex (girls) school with a medium level of family income. The school population consists of student's grades of seven, eight, and nine, which for this study, all students of class eight were placed.

Instruments

Implicit Theories of Intelligence Scale
This is a fourteen-item scale measuring belief about intelligence (Abd-El-Fattah & Yates, 2006) that is used to assess implicit theories of intelligence (ITI). The response options range from 1 (strongly agree) to 4 (strongly disagree) on a Likert-type scale. The scale has seven entity items in which high scores represent an entity theory of intelligence. Seven of the items represent an incremental theory of intelligence. The sample items were "You have a certain amount of intelligence, and you cannot do much to change it" and "No matter who you are, you can significantly change your intelligence level".

Achievement Goal Questionnaire
Achievement goal questionnaire was adopted in the study is by Elliot and Murayama (2008), revised Achievement Goal Questionnaire (AGQ-R). It assesses four different kinds of achievement goals of learning (mastery) approach goal, performance-approach goal, and performance-avoidance goal Elliot & Murayama (2008) adapted by Moshtaghi, Mirhashemin, & Sharifi, (2013). The items in each orientation indicate learning, performance, learning avoidance, or performance-avoidance. Each orientation consists of three items that assess different kinds of achievement goals. Students were told, "The following questions ask about what is important to you as a student."

Incremental Mindset Toolkit
For this study, the mindset kit chosen as a research-based method taken from the PERTS stands for the Project for Education Research. This intervention is a classroom-based activity to teach

students how the brain changes with learning and how they can use brain-based study strategies to speed up their progress. The intervention aimed to guide the students with the strategies and study skill resources, activities to promote learning, explain how negative emotion can influence the brain and how they manage negative emotions by enhancing positive ones on the way the brain works and grows. The incremental mindset intervention applied in the five sessions of 45 minutes in the class with the treatment group, while the control group did not receive any treatment. The original programs are offered in the English language, which translated into Persian by back to back translation based on the culture and setting of the target sample (https://www.perts.net/programs).

To examine the reliability of questionnaires, the researcher utilized the estimates of internal consistency -Cronbach's alpha. Cronbach's alpha is a commonly used measure employ to test the extent to which multiple indicators for the latent variable, belong together (see Table 1).

Table 1. Internal Consistency Estimation-Cronbach's Alpha

Scale	Number of items	Cronbach's Alpha
Entity Mindset	7	0.717
Incremental Mindset	7	0.797
Learning Goal	3	0.765
Performance Goal	3	0.839
Learning avoidance Goal	3	0.870
Performance-avoidance Goal	3	0.807

Intervention Protocol

Pilot research was implemented to determine the validity and reliability of research instruments before the actual data collection. The pilot conducted with 30 volunteer students from another school. The full-scales study and a brief incremental mindset intervention were implied with 30 volunteer students from another school with similar grades, ages, and gender. The researcher provided the main points of the intervention in a brief session of 45 minutes. After the pilot study, five sessions of the Incremental mindset workshop have conducted after the pre-test with the experimental student group in the classroom. The post-test was conducted after three weeks and follow-up after four months to assess whether the effect of intervention changed throughout the workshop.

Based on previous research, the main modules that applied included: **Brain basic:** Introduces the physical basis of brain function and structure. Explains how we can improve our learning under a growth mindset. Showing the chemical messages through the nerve cell network and the process of growth through neural network connections with repeated use, which make our thoughts and ability. To provide an insight into the foundation of learning by showing a perspective of human newborn baby and animal's brain and the effect of learning. **Celebrate Mistakes:** Mistakes and failure to achievement and excellence and developing learning. Showing students plasticity, practice, and learning how the brain is like a muscle and getting smarter by challenging and getting mistakes. Self-talk about mistakes and failures and also on how to change that self-talk. Telling the real stories about people's struggles and asking students to tell their own story of failure or success can help them express their feelings and influence their attitudes, beliefs, and behaviours. **Mindset and Goals:** Explain learning and performance goals, set the goals for what they will learn. To guide the students with the strategies and study

skill resources, activities to promote learning. Explain how negative emotions can influence the brain and how they manage negative emotions by enhancing positive ones on how the brain works and grows (see Figure 1).
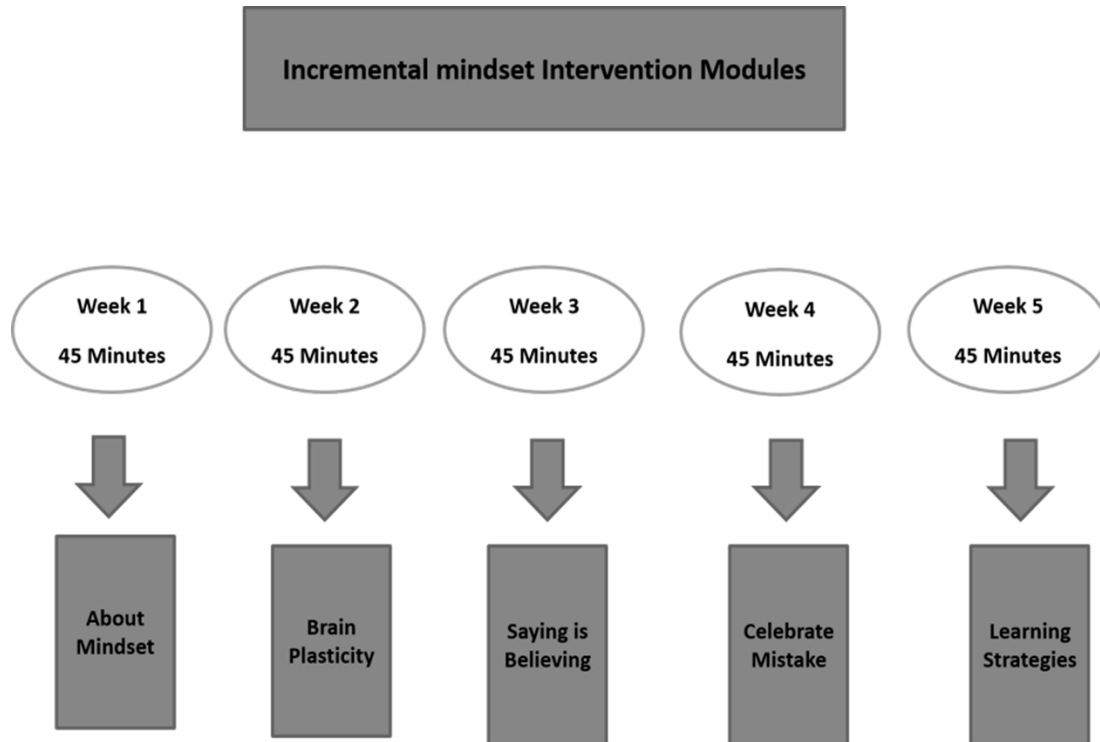

Figure 1: Intervention Protocol

Data Analysis
Data analysis was applied after the data were entered into the statistical package of social sciences (SPSS Version 25). Exploratory Data Analysis (EDA) involved computing various descriptive statistics and graphs to assess potential problems in data, such as outliers, non-normal distributions, issues with coding, missing values, and errors during data input. The inferential method included a two-way repeated measure analysis of variance (RM-ANOVA/RM-MANOVA), followed by Bonferroni test for mean comparison between control and experimental groups at three repetitions (pre-test, post-test, and follow-up test). Before the data analysis, preliminary assumption testing, normality, linearity, and equality of variance were conducted.

Finding

Effect of Incremental Mindset Intervention on Student's Implicit Theories
To study the differences in the mean score of the implicit theories within the three stages of pre-post and follow up a test between two groups (i.e., experimental and control), a two-way repeated measure ANOVA was applied to analyze whether their groups were different across the time for the implicit theories. Table 1 shows the descriptive statistics of implicit theories across time accordingly.

Table 1. Mean and Standard Deviation of Implicit Theories Score at Pre, Post and Follow-Up Test

Variable	Test	Group	Mean	SD
Entity Mindset	Pre-Test	Experimental	2.585	0.566
		control	2.479	0.519
	Post-Test	Experimental	1.650	0.338
		control	2.368	0.610
	Follow Up	Experimental	1.848	0.451
		control	2.474	0.497
Incremental Mindset	Pre-Test	Experimental	2.853	0.323
		control	3.001	0.348
	Post-Test	Experimental	3.709	0.269
		control	3.124	0.470
	Follow Up	Experimental	3.349	0.364
		control	3.087	0.423

Multivariate test outcomes (Table 2) revealed a significant mean differences interaction between time and groups (control and experimental) on the student implicit theories of intelligence variable at 0.05 level of significance, Wilks' Λ=0.481, F =12.673, p<0.001, and multivariate $\eta2$=0.519 (Table 2 and Figure 2).

Table 2. Analysis of Variance for Implicit Theories of Intelligence.

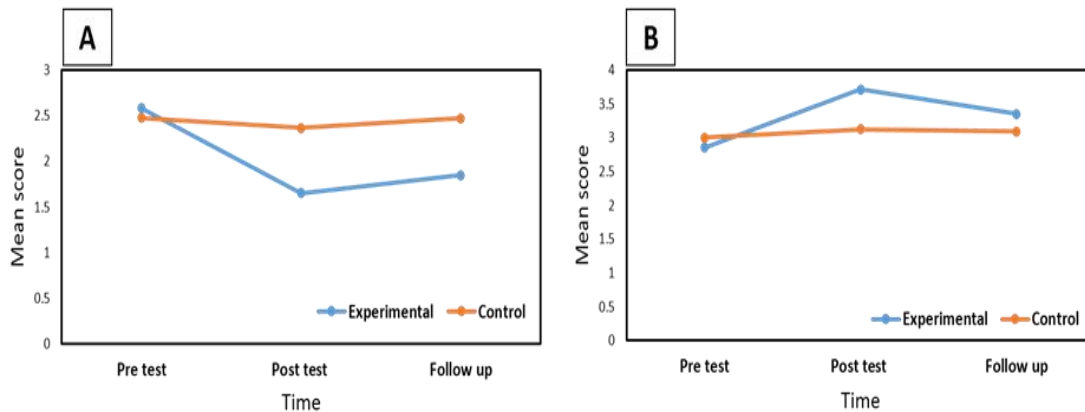| $\eta2$	P value	F value	Wilks' Lambda
0.263	0.001	8.76	0.737
0.657	0.00	22.545	0.343
0.519	0.00	12.673	0.481

Figure 2. The Mean Plot Of A) Entity Mindset, B) Incremental Mindset In The Control And Experimental Groups Across Time.

Effect of Incremental Mindset Intervention on Student's Achievement Goals

To evaluate the differences in the mean score of achievement goals within the three stages of pre-post and follow up tests between two groups (i.e. experimental and control), a two-way repeated measure ANOVA was applied to analyses whether their groups were different across the time for achievement goals. Table 3 and 4 shows the descriptive statistics of approach goals (Learning and Performance goal) and avoidance goals (Learning avoidance, Performance and avoidance goal).

Table 3. Mean And Standard Deviation of Approach Goals Score at Pre, Post and Follow-Up Test.

Variable	Test	Group	Mean	SD
Learning Goal	Pre-Test	Experimental	5.677	0.601
		control	5.842	0.911
	Post-Test	Experimental	6.770	0.358
		control	6.044	0.986
	Follow Up	Experimental	6.333	0.708
		control	5.855	0.765
Performance Goal	Pre-Test	Experimental	6.011	0.805
		control	5.971	0.943
	Post-Test	Experimental	5.253	1.041
		control	5.913	0.912
	Follow Up	Experimental	5.931	0.626
		control	5.869	0.979

Table 4. Mean and Standard Deviation of Avoidance Goals Score at Pre, Post and Follow-Up Test.

Variable	Test	Group	Mean	SD
Learning Avoidance	Pre-Test	Experimental	5.402	0.808
		control	5.465	1.149
	Post-Test	Experimental	4.448	0.964
		control	5.494	1.077
	Follow Up	Experimental	4.828	0.716
		control	5.550	0.814
Performance Avoidance	Pre-Test	Experimental	5.518	0.962
		control	5.580	1.016
	Post-Test	Experimental	4.770	1.219
		control	5.536	1.003
	Follow Up	Experimental	4.919	0.721
		control	5.623	0.669

Results of the multivariate analysis indicated a significant interaction between time and groups (control and experimental) on the student's achievement goals (Wilks' Λ=0.434, F=7.001, p<0.001, η^2=0.566) which revealed that the groups showed different patterns across time for all subcomponents of motivation.

Following the RM-MANOVA and to evaluate the differences in the mean score of all four subcomponents of achievement goals within the three stages of pre-test, post-test and follow-up test between the two groups (experimental and control), a multivariate two-way repeated measure of MANOVA was applied to assess whether the groups were significantly different across time for achievement goals. The results of repeated measure MANOVA on learning goal orientation score showed that the overall effect of time on learning goal orientation was statistically significant (F (2, 100) = 21.831, P<0.001, η^2=0.304) and the main effect of group was statistically significant (F (1, 50) =4.148, P=.047, η^2=0.077). This result revealed that the interaction between group and time was statistically significant (F (2, .100)=11.013, P<0.001, η^2=.180), which means groups had a different pattern over time.

These results for performance goal orientation score showed that the overall effect of time on performance goal orientation was statistically significant (F (1.62, 81.09) = 6.091, P<0.001, η^2=0.109) but the main impact of the group was not statistically significant (F (1, 50) =0.835, P=0.365, η^2=0.016). This result revealed that the interaction between group and time was statistically significant (F (1.62, 81.09) =5.585, P<0.001, η^2=0.100), which means groups had a different pattern over time.

The results also relieved that the overall effect of time on learning avoidance goal orientation was statistically significant (F (2, 100)=4.467, P=0.014, η^2=0.082) and the main effect of group was statistically significant (F (1, 50)=10.803, P=0.002, η^2=0.178). This result revealed that the interaction between group and time was statistically significant (F (2, 100)=5.239, P=0.007, $\eta2$=0.095), which means groups had a different pattern over time.

The results of for performance-avoidance goal orientation score showed that the overall effect of time on performance-avoidance goal orientation was statistically significant (F (2, 100)=3.327, P=0.040, η^2=0.062) and the main impact of group was statistically significant (F (1, 50)=6.851, P=0.012, η^2=0.121). This result revealed that the interaction between group and time was not statistically significant (F 2, 100) =3.060, P=.051, η^2=.058), which means groups had a different pattern over time. The additional information about the above within-between groups section is presented in Table 5.

Table 5. Mean Comparison of Achievement Goals Between Groups Across Time.

Variables	Test	Groups		MD	SE	P value	95% CI Lower Bound	Upper Bound	η^2
Learning Goal	**Pre-test**	Exp	Ct	-0.165	0.210	0.436	-0.587	0.257	0.012
	Post-test	Exp	Ct	0.726*	0.197	0.001	0.330	1.122*	0.213
	Follow-up	Exp	Ct	0.478*	0.205	0.024	0.066	0.889*	0.098
Performance Goal	**Pre-test**	Exp	Ct	0.041	0.0242	0.868	-0.446	0.527	0.001
	Post-test	Exp	Ct	-0.660*	0.275	0.020	-1.213	-0.107	0.103
	Follow-up	Exp	Ct	0.062	0.224	0.784	-0.387	0.510	0.002
Learning Avoidance Goal	**Pre-test**	Exp	Ct	-0.063	0.272	0.817	-0.609	0.483	0.001
	Post-test	Exp	Ct	-1.046*	0.284	0.001	-1.616	-0.476*	0.214
	Follow-up	Exp	Ct	-0.723*	0.212	0.001	-1.149	-0.296*	0.188
Performance Avoidance Goal	**Post-test**	Exp	Ct	-0.062	0.275	0.823	-0.615	0.491	0.001
	Follow-up	Exp	Ct	0.765*	0.315	0.019	-1.398	-0.132*	0.105
	Follow-up	Exp	Ct	-0.704*	0.195	0.001	-1.096	-0.312*	0.207

In this regard, Figure 3 shows the mean plot of achievement goals mean scores in the control and experimental groups across time. As can be seen in the experimental group, the achievement mean scores changed, while it was consistent in the control group across time.
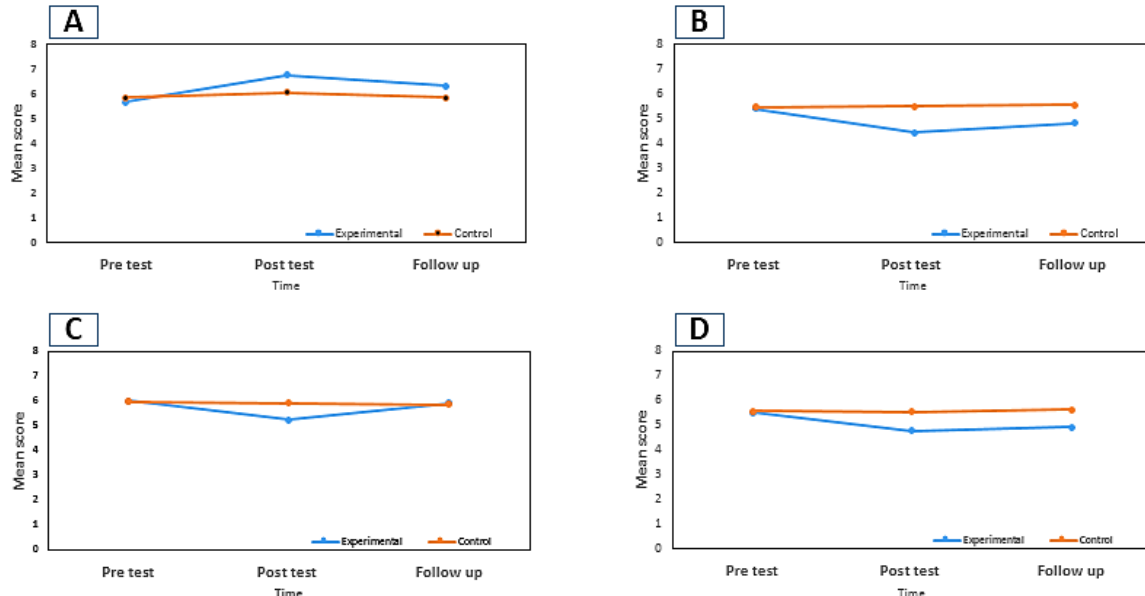

Figure 3. The Mean Plot Of A) Learning Goal B) Performance Goal C) Learning Avoidance Goal D) Performance Avoidance Goal In Experimental And Control Groups Across The Time.

Result and Discussion

The present study uses data from a quasi-experimental design in a high school and classroom intervention to investigate implicit theories' effect on achievement goals. Previous research suggested student's theory of intelligence as a critical belief to achievement goals pattern. The result of this study shows the students with a robust incremental mindset were more eager to set the goals that endorse on learning and ability growth, whereas students with an entity mindset were less likely to set the goals that oriented in the effort and growing (Blackwell, 2007; Mathur et al., 2013; Timpone, 2012). The result showed that the experimental groups scored significantly higher than the control group in the learning (mastery) goal. This result also revealed a significant effect on performance goal in the experimental group (p= .001) but not significant between pre-test and follow up in both groups. However, the learning avoidance and performance-avoidance goals were significantly decreased in the experimental group after intervention which in the follow-up test, the significant effect was reported.

In her model, Dweck does not claim that motivation is determined directly by someone's implicit theory of intelligence, but that the mediation of this relationship is by her or his goal orientation. According to Dupeyrat and Marine (2005), there are fewer researches that have studied the relationships between implicit theories of intelligence and goal orientation, in the academic context, and also few studies have done only partially support Dweck's postulates (Dupeyrat & Mariné, 2005). Findings of Chen and Pajares (2010) show the students advocating units of incremental ability are more inclined to adopt learning goals and display adaptive behaviour, resulting in significant academic outcomes.

In line with the previous studies, the current research showed the significant effect of the intervention on the achievement goal and endorses that adolescents who approve an incremental mindset have stronger learning goal orientation, while those with entity mindset are inclined to a performance goal (Blackwell, 2007; Burnette et al., 2013; Martin, 2015). Elliot et al. (2017) mentioned the empirical pattern for mastery avoidance goals. These avoidance goals, tend to be negative predictors of performance and positive predictor of anxiety, procrastination, and maladaptive form of perfectionism (Elliot, Dweck, & Yeager, 2017). The present research reconsidered the role of implicit theory of intelligence as an antecedent of achievement goals. Based on a carefully designed experimental design, this study concludes that individuals' conception of their intelligence directly causes mastery goal adoption, but neither determines performance-approach.

This study extended the previous study of Heyman and Dweck (1992), which suggested that motivation based on performance goals can be maladaptive while promoting adaptive motivation is not concerned only with learning goals and completely ignoring performance goals. It is claimed to ignore the performance goals could potentially be maladaptive. Performance goals have a vital role in gaining the best result in the academic domain, like good grades or obtaining productive output requirements. We found the manipulation to create differences in performance goals was not succeed trough the time, and students in the incremental condition like those in the entity condition were less orientated toward avoidance of performance-approach goals. The statistic result revealed that the performance goal means score between experimental and control group in pre-test was not significant (p>0.05). In contrast, the variances between experimental and control were significant for performance goal in post-test (p<0.05) but follow up test was not significant (p=0.784) which means student's tend to have performance goal after the effect of the intervention is faded. However, due to the inconsistent findings in the literature, we do not form a hypothesis for performance approach goals. In line with normative goal theory, mastery goals were adaptive; but also, with the revised goal theory perspective, approach performance goals, when coupled with mastery goals, were just as adaptive. Indeed, the directional nature of individuals' characteristic orientations and their goal-setting still is not clear-cut (Dinger et al., 2013).

Conclusion

The statistical analysis evaluated the interaction of goal orientations between the control and experimental groups in pre-, post-, and follow-up tests. It is reported that Dweck's theory of mindsets in a new educational context can gain real opportunities in the educational setting. In this regard, this study's results confirmed that incremental mindset intervention could change students' mindset, encourage them to remove obstacles and create pathways to learning. Furthermore, our results demonstrated the effect of interventions on promoting student's growth mindsets as a useful motivational tool in the academic domain. The results of this study also indicated that the mindset interventions have a positive and negative effect on the student's approach and avoidance goal orientations. It is important to note that the obtained results agree with the previous studies that suggest that interventions could be applied in classroom settings. However, our follow-up tests also endorsed that a brief but theoretically informed intervention has a long-term effect on students' mindset and goal orientations.

Acknowledgment

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