

Relationship between Mastery Goal Orientation and ICT Use Outside School: Moderation Role of ICT Self-efficacy

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Keywords: Using of ICT outside school, ICT self-efficacy, mastery goal orientation, PISA

Abstract: During the Covid-19 pandemic, the role of learning outside of school has become increasingly important due to the extensive closures of schools. Using of Information and communication technology (ICT) can be an effective way to promote students' learning outcomes when they stay at home. The achievement goal theory emphasizes the importance of mastery goal orientation in students' self-regulated learning. To date, little is known about the effect of goal orientation on students' using of ICT outside of school for school work. Besides, their ICT self-efficacy is another important factor in using of ICT. Thus, the present study investigated the relationship among these factors by using PISA 2018 cycle data in the US. Results showed that students' mastery goal orientation and ICT self-efficacy significantly influence using of ICT outside school for schoolwork. ICT self-efficacy also moderated the relationship between students' mastery goal orientation and using of ICT outside school for schoolwork.

1. Introduction

During the Covid-19 pandemic, the role of learning outside of school has become increasingly important [1], since the closures of schools all around the world [2]. ICT applications provide opportunities for students to access learning resources from distance education[3]. Before the Covid-19 pandemic, Information and communication technology (ICT) had been widely used in educational settings, with the development of modern technology, to facilitate students' learning in different domains, such as science and mathematics[4-5]. Therefore, how to improve students' use of ICT outside of school is worthwhile to address in the educational field. The factors which have influences on students' use of ICT outside of school for academics have been investigated [6-7]. The goal orientation theory[8] provides explanations of learners' motivation in engaging different academic activities and domains[9]. Students with mastery goal orientation show higher levels of motivation and engagement than those with performance goal orientation[10]. However, to my knowledge, few studies have investigated if mastery goal orientation influences students' use of ICT outside of schools for school-related activities to improve their learning.

In the present study, the relationship between mastery goal orientation and ICT outside of schools was investigated to shed light on the role of motivational factors in this relationship, and the potential role of students' self-efficacy in this relationship was also considered.

2. Literature review

The achievement goal theory divided learners into two different goal orientations: mastery and performance[11]. Students with mastery goal orientation tend to improve themselves with higher levels of competencies, harder work, and more persistent efforts. Besides, autonomy increases when students who are more mastery goal orientated experience less academic stress [12]. Given the importance of mastery goal orientation in self-regulated learning, the extent of learning outside of schools can be related to goal orientation.

Information and Communication Technology (ICT) has been widely used as a tool to facilitate students' learning not only at school but also at home[13]. The use of ICT at school has been found to facilitate different learning outcomes[14]. However, some suggested that there is no significant association between ICT and achievement[15]. Some studies indicated that school ICT use had a significant negative influence on students' performance. On the other hand, Petko et al., found a positive relationship between the use of ICT at home and mathematics, science, and reading achievement. The use of ICT is also related to students' self-efficacy[16]. Self-efficacy refers to one person's belief in his/her capacity to reach a specific performance goal[17]. ICT self-efficacy is defined as the cognitive or motivational aspects of ICT engagement[18]. ICT self-efficacy was also found to be related to students' ICT literacy. Thus, given the importance of using ICT outside of schools nowadays, and the potential influences of goal orientation as well as ICT self-efficacy, the present study focused on the following research questions:

RQ1: To what extent does students' mastery goal orientation influence their use of ICT outside of school for academic purposes?

RQ2: To what extent does students' ICT self-efficacy influence their use of ICT outside of school for academic purposes?

RQ3: To what extent does ICT self-efficacy influence the relationship between students' mastery goal orientation and their use of ICT outside of school for academic purposes?

3. Methods

3.1 Participants

This study comprised a secondary data analysis of the Programme for International Student Assessment (PISA) 2018 assessment. There were 79 countries participating in PISA 2018 cycle, in which 600,000 students aged around 15-years-old represented around 32 million students in such countries [18]. The present study investigated 4838 students in the United State who participated in PISA 2018. 49.1% of American students reported their gender as female ($N = 2376$), while 50.9% self-reported their gender as male ($N = 2462$). Participants' mean age in 2018 was $M = 15.8$ ($SD = .29$).

3.2 Data Collection

In PISA 2018 cycle, American data were collected via computer-based tests which took a total of two hours for the assessment. Students took part in the achievement tests with a multi-step adaptive approach, and they were assigned to a block that contained test items according to their performances in the previous block. Also, they needed to answer a background survey that investigated their basic information regarding students themselves, the background survey took around 35 minutes. [19]

3.3 Variables

Variables that were included in the present study are students' use of ICT outside of school for schoolwork activities (HOMESCH), their ICT self-efficacy (COMPICT), and mastery goal orientation (MASTGOAL).

HOMESCH was measured in the ICT familiarity questionnaire by asking about the frequency of using the digital device outside of school for schoolwork. The response ranged from "Never or hardly ever" to "Every day". COMPICT was measured in the ICT familiarity questionnaire by using a 4-point Likert scale, the response ranged from "Strongly disagree", "Disagree", "Agree", to "Strongly agree". Lastly, MASTGOAL was measured in PISA 2018 cycle as the dispositional variable with three items asking how true the statements are for the student. The response ranged from "not at all true of me", "slightly true of me", "moderately true of me", "very true of me", and "extremely true of me".

3.4 Data Analysis

The moderation analysis was run in this study by employing SPSS v26 with PROCESS macro Version 4.1[20]. In a moderation model, one or more variables (variable W) would moderate the effect of the independent variable (Variable X) on the dependent variable (Variable Y) via influence the direction, and/or the power of this effect[21]; The moderator (variable W) could be a continuous or categorical variable.

In the moderation model, students' mastery goal orientation was set as the independent variable, their use of ICT outside of school for schoolwork activities was set as the dependent variable, and ICT self-efficacy was set as the moderator. All continuous variables were centered in the PROCESS macro Version 4.1 package. Besides, missing data in all three variables were less than 5%.

4. Results

4.1 Preliminary Results

Table 1: Descriptive Statistics of All Variables.

	MASTGOAL	COMPICT	HOMESCH
N	4608	4404	4441
Mean	.3082	.1204	.2310
Standard deviation	1.0186	.9325	.9938
Minimum	-2.5252	-2.6033	-2.3008
Maximum	1.8524	1.9885	3.3070

Notes: HOMESCH = students' use of ICT outside of school for schoolwork activities, COMPICT = ICT self-efficacy, MASTGOAL = mastery goal orientation

Table 2: Correlations of All Variables.

	MASTGOAL	COMPICT	HOMESCH
MASTGOAL	—		
COMPICT	.119**	—	
HOMESCH	.228**	.211**	—

Notes: * $p < .05$, ** $p < .01$, *** $p < .001$.

HOMESCH = students' use of ICT outside of school for schoolwork activities, COMPICT = ICT self-efficacy, MASTGOAL = mastery goal orientation

The descriptive statistics of all included variables were shown in Table 1. Table 2 showed the

correlations among all variables included in this study. There were positive and statistically significant correlations between HOMESCH, COMPICT, and MASTGOAL ($r_s = .228, .119,$ and $.211,$ respectively; $p_s < .001$).

4.2 Moderation Results

After examining whether COMPICT moderated the relationship between HOMESCH and MASTGOAL, moderation analysis was conducted using Hayes' PROCESS macro (Hayes, 2022) in SPSS v 26 (see Table 3). According to the result, the interaction between MASTGOAL and COMPICT was significant, $b = .0353, p < .01,$ % CI (.0088 to .0618).

The regression results indicated that the moderation model is significant with R^2 is .2967, which means that 29.67% of the variance of students' use of ICT outside of school for schoolwork activities can be explained by their mastery goal orientation, ICT self-efficacy, and the interaction between HOMESCH and MASTGOAL. For students' mastery goal orientation, the coefficient ($b = .1943, p < .001$), means on average, with 1 point increase in students' mastery goal orientation, their use of ICT outside of school for schoolwork increases by 0.1943, controlling for their ICT self-efficacy. For students' ICT self-efficacy, the coefficient ($b = .1869, p < .001$), means on average, with 1 point increase in students' ICT self-efficacy, their use of ICT outside of school for schoolwork increases by 0.1869, controlling for their mastery goal orientation.

Table 3: Moderation Analysis Results.

	Estimate	SE	95% CI		<i>t</i>	<i>p</i>
			Lower	Upper		
constant	.1373	.0152	.1075	.1670	9.0554	<.001
MASTGOAL	.1943	.0144	.1660	.2226	13.4783	<.001
COMPICT	.1869	.0161	.1553	.2186	11.5885	<.001
Interaction	.0353	.0135	.0088	.0618	2.6152	.0089

Notes: COMPICT = ICT self-efficacy, MASTGOAL = mastery goal orientation

5. Scholarly Significance

First, the present study found a positive relationship between students' mastery goal orientation and their use of ICT outside of school for schoolwork. This finding was consistent with previous studies which stated that mastery goal orientation positively influenced students' self-directed learning[22]. That is, students with mastery goal orientation showed higher levels of self-control strategies to adjust their learning behaviors[23]. Especially in this pandemic, students' self-directed or self-control learning becomes increasingly important due to the greater amount of distance education. Their use of ICT outside of school for schoolwork provided affluent educational resources, and the mastery goal orientation influenced the willingness of utilizing such resources. It is important to promote their autonomy in learning during this period by paying attention to their goal orientation.

Second, the present study also found a significant relationship between students' ICT self-efficacy and their use of ICT outside of school for schoolwork. This relationship has been investigated to promote students' ICT literacy [24]. The finding of the present study shed light on the importance of promoting students' ICT literacy as well as their subjective perceptions. The lower levels of ICT self-efficacy could negatively influence their use of ICT, especially outside of school, to facilitate their academic achievement.

Last, the moderation role of ICT self-efficacy in the relationship between students' mastery goal orientation and use of ICT outside of school for schoolwork was found in the present study. The

finding suggested that even if mastery goal orientation plays an important role in using ICT outside of school for schoolwork, students' ICT self-efficacy moderated this relationship, which means the given level of students' mastery goal orientation could influence their use of ICT outside of school for schoolwork differently because of their different levels of ICT self-efficacy. With a lower level of ICT self-efficacy, even if students with higher levels of mastery goal orientation, their willingness of using ICT outside of school for schoolwork could decrease, therefore losing the autonomy of learning.

6. Conclusion

According to the results from data analyses, students' higher levels of mastery goal orientation and ICT self-efficacy related to higher levels of use of ICT outside of school for schoolwork. Moderation analysis revealed that students' ICT self-efficacy positively moderated the relationship between students' mastery goal orientation and use of ICT outside of school for schoolwork, which means with higher levels of ICT self-efficacy, the effect of their mastery goal orientation on the use of ICT outside of school for schoolwork increased.

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