

Developing the Collaborative Problem Solving Scale

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Abstract: The present study aims to develop the “Collaborative problem solving scale”, which is able to reveal the collaborative problem solving competency. The participants of this study were 76 high school students (tenth graders) who received a collaborative problem task for 70-80minutes. After completing the collaborative problem solving task, the participants filled out the preliminary version of “Collaborative problem solving scale”. Exploratory factor analysis was conducted and four major subscales yielded: “Reflect”, “Propose”, “Passive”, and “Role”. Based on the results, the scale will be subjected to further analysis such as correlation analysis and multiple regression analysis with other scales so as to further examine the criterion-related validity of this “Collaborative problem solving scale” (CPSS).

Keywords: Collaborative problem solving, Educational technology

1. Introduction

Collaborative problem solving has been recognized as a critical ability for modern citizens in such situations as international collaboration across countries (Serçe et al., 2011; Veerman, 2001). Developing the scale of collaborative problem solving is able to reveal the features of the collaborative problem solving competency.

2. Method

Participants

With the consensus and the help of school administrators and home room teachers, a total of 76 high school students participated the present study. The participants were in their first year of high schools (tenth grade), and were from two classes and two separate schools, both of which located in suburban Taipei in Taiwan. After these 76 participants completed a collaborative problem task for 70-80 minutes, the collaborative problem solving scale were filled out by these participants in about 15 minutes.

The development of the collaborative problem solving scale

The design of the “Collaborative problem solving scale” was based on both the CSCL literature and the framework of collaborative problem solving literacy proposed by PISA 2015, from which the major categories of the “Collaborative problem solving scale” were elicited. The development of the items was conducted by two researchers, both of whom major in educational psychology and educational technology. The preliminary version of the collaborative problem solving scale was reviewed by professors who specialized in computer science education.

The “Collaborative problem solving scale” was subjected to exploratory factor analysis. Having an eigenvalue above 1 was the criterion for determining the number of factors. Items with factor loadings lower than 0.60 were ruled out in order to satisfy the validity of the scale for conducting further analysis.

3. Results

Exploratory factor analysis for the “Collaborative problem solving scale”

A total of four major categories (subscales) were elicited. Each subscale was examined with Mean (S.D.), factor loading, variance explained, and Cronbach’s alpha (see Table 1).

3.1.1 ”Reflection” (6 items) measures the degree to which an individual reflect on his or her behavior during collaborative problem solving task (e.g., RE1: I think of the role I play in the team; RE2: I think of whether I complete the task I am assigned to do; RE3; I think of the appropriateness of the assigned-task).

3.1.2 “Propose” (7 items) measures the degree to which an individual propose his/her own ideas during collaborative problem solving task (e.g., PR1: I discuss the weakness and strength of the possible solutions; PR2: I propose my own ideas for the questions; PR3: I discuss the feasibility of the possible solutions with my teammates).

3.1.3 “Passive” (5 items) measures the degree to which an individual disengage in the collaborative problem solving task (e.g., PA1: I do not response to my teammates; PA2: When I encounter difficulties, I do not propose for further discussion; PA3: Usually I do not propose the possible solutions that I think of).

3.1.4 “Role” (3 items) measures the degree to which an individual assign their roles during collaborative problem solving task (e.g., RO1: I discuss with teammates about how we can assign the task; RO2: I understand the role that the team have given to me; RO3: I complete the task that I have been assigned).

Table 1: Exploratory factor analysis of the “Collaborative problem solving scale” (CPSS)

Scale(items)	Mean (S.D.)	EFA loading	Variance explained	alpha
Reflection	4.66(0.86)		22.96	0.91
RE1		0.81		
RE2		0.80		
RE3		0.79		
RE4		0.74		
RE5		0.74		
RE6		0.71		
Propose	4.87(0.78)		22.60	0.93
PR1		0.84		
PR2		0.81		
PR3		0.73		
PR4		0.70		
PR5		0.67		
PR6		0.67		
PR7		0.66		
Passive	4.64(1.33)		14.93	0.86
PA1		0.88		
PA2		0.81		
PA3		0.78		
PA4		0.73		
PA5				
Role	4.47(0.93)		12.86	0.79
RO1		0.80		
RO2		0.75		
RO3		0.71		

4. The development this collaborative problem solving scale

In order to understand the criterion-related validity of this scale, the “Collaborative problem solving scale” will be further examined by probing the correlations between the “Collaborative problem solving scale” (CPSS), “Online Information Searching Strategy Inventory” (OISSI), and “Online Discussion Strategies Scale” (ODSS) so as to unveil the criterion-related validity for the “Collaborative problem solving scale” (CPSS).

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