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Construction and Standardization of Knowledge Construction Scale in Economics

Prof. Ram Mehar
Department of Education, CDOE, Panjab University Chandigarh

Dr. Prabhjit Kaur
Assistant Professor, Khalsa College of Education, Ranjit Avenue, Amritsar

Abstract

This paper highlights the process of construction and standardization of knowledge construction scale in economics for school students. Scardamalia and Bereiter (2003) defined knowledge construction as, "the production and continual improvement of ideas of value to a community, through means that increase the likelihood that what the community accomplishes will be greater than the sum of individual contributions and part of broader cultural efforts". According to Woolfolk (2008), students use to construct their own meaning or knowledge according to current theories of learning and supported teaching method that give opportunity to students to involve actively in the learning process. The scale initially consisted of 41 items after review and evaluation by subject experts, which were reduced to 33 in the first try out and then finally to 25 items in the final draft after the item analysis. The test-retest reliability of the test was computed to be 0.71. Content validity was calculated and the scale was found to be valid.

Keywords: Construction and Standardization, Knowledge Construction Scale

Introduction

Knowledge building or knowledge construction is one of the most widely used concepts in the computer supported collaborative learning. Scardamalia and Bereiter (2003) aims at emphasizing the process of producing externally visible "knowledge objects", such as scientific concepts and theories. They defined knowledge building "as the production and continual improvement of ideas of value to a community, through means that increase the likelihood that what the community accomplishes will be greater than the sum of individual contributions and part of broader cultural efforts". They also defined the idea of knowledge building communities as: "Groups of persons exchanging ideas, information and experiences to reach a more advanced level of knowledge."

The students use to construct their own meaning or knowledge according to current theories of learning and supported teaching method that give opportunity to students to involve actively in the learning process (Woolfolk, 2008).

Knowledge construction is the heart of the learning process which determines the success of any learning endeavor. The issue of knowledge construction is still relevant, regardless of the nature of any learning environment. Consequently, the birth of online learning environment invite speculation on how do people construct knowledge in this environment. The implementation of online discussion is said to great potential to give opportunities to

students to intellectually engage in the process of knowledge construction. In the cognitive and constructivism learning tradition, knowledge construction "plays an important role" in determining the effectiveness of learning process. It focuses on how people process information and transforms it to become knowledge (Woolfolk, 2008).

The nature of knowledge construction has been discussed extensively in the literature, including the epistemological foundation of knowledge construction, cognitive and social-cultural views of knowledge construction, and the tools facilitating the knowledge construction process. As the epistemological foundation of knowledge construction, social constructionism uncovers how social reality is created, institutionalized, and becomes the routine of our daily life. Berger (1967) analyzed how common sense knowledge is socially constructed and is institutionalized into the structure of the organization and society that can be socially controlled and accessed by the public.

Process of Knowledge Construction

In the knowledge construction process, knowledge is shared, selected, and institutionalized, facilitated by different tools. For Vygotsky (1978), the most important for human mastery is to create and make use of "artificial" stimuli including the tools of the culture, language, the toys in the play, etc (Vygotsky & Cole, 1978). The functions of tools such as culture, social interaction, discussion/dialogue, socialization, and technology in the knowledge construction process have been broadly explored. The process of knowledge construction is explained in following steps:

(i) *Activating Knowledge:* Making knowledge active means to make it explicit and accessible to all stakeholders. Both users and developers got benefit from "activation." For developers, activating knowledge is crucial to gain an understanding of the problem to be solved. For users, activating knowledge can mean to see the familiar aspects of their practice in new ways. The problem activation addresses is that experts know more than they can say. Many philosophers argue that practical knowledge (i.e., the knowledge to participate in a practice) is fundamentally taken for granted, or tacit.

(ii) *Communication:* Communication is the second essential process in the creation of knowledge. Information is sent from one person to another through a communication process. This assumption seems to hold in unproblematic communication, such as that between people who share a common background. But when we think of the difficulties in communicating with someone from a different background from our own, it is evident that "the phenomenon of communication depends on not what is transmitted, but on what happens to the person who receives it and this is a very different matter than `"transmitting information" (Ostwald & Fischer, 1996). Communication is defined here as the creation of shared understanding through interaction

among people. Communication creates common ground, or presumptive "mutual beliefs and knowledge," which is gained and updated by an interactive, continuing process rather than an absolute or full understanding (Clark & Brennan, 1991).

(iii)Envisioning: The 3rd fundamental process of creating knowledge is to imagine. It means to know how the current practice will or could be changed by new computer support - the possibilities and implications of new relationships between tools, tasks and information. "Envisioning is a constructive process in the sense that it is based on prior understandings but extends toward the future." Therefore, it differs from activation because it generates new understandings instead of replacing existing ones. Sharing visions of the future requires that both users and developers contribute to a useful synthesis of knowledge. Users don't know the technological possibilities for changing their practice, and developers don't know whether the technology they create will be appropriate for the given practice (Kensing & Munk-Madsen, 1993).

Process of Construction of Knowledge Construction Scale in Economics

The process of construction of knowledge construction scale in economics is carried out in three stages such as: (i) planning phase (ii) construction phase (iii) standardization phase. The description of these phases is given below:

(i) Planning Phase: The scale was created to measure the level of knowledge created by students in economics according to the knowledge construction in economics, after the researcher reviewed the literature from a variety of sources, including journals, newspapers, books, official sources, and web sources. The measurement of level of knowledge construction can prove helpful to educational institutions and teachers in identifying the intellectual level of the students and to provide guidance accordingly. The knowledge creation ratings encompass a more comprehensive idea that extends beyond the limited scope of teaching assessments. To fully comprehend the intricacy of the level of knowledge experience, it is insufficient to only gauge students' understanding of a concept and their level of knowledge. Five response categories are provided for responding to each item. These response categories are: (i) Strongly Agree (ii) Agree (iii) Undecided, (iv) Disagree and (v) Strongly Disagree.

(ii) Construction Phase: Knowledge construction is a collaborative process which aims to produce new understanding or knowledge which exceeds something that anyone alone could not achieve. It is also essential that knowledge construction is based on each others' ideas and thoughts.

Knowledge construction includes activation, communication and envisioning of knowledge. After careful exploration of literature, a pool of 41 items on different dimensions were written and edited. The following points were kept in mind while writing the items such as (a) Items were related to area of investigation (b) Items were comprehensive to the respondent (c) The language of the items was such that the respondents can immediately identify with the situation expressed in the item (d) Those items were avoided that could be interpreted in more than one way or about which contradictions could arise (e) The number of items selected was greater than to be retained in the scale.

(iii)Standardization Phase: A number of assertions were produced with the assistance of seasoned colleagues, school principals, economists, and students based on the body of literature on knowledge building that was at the time of writing. The economics knowledge construction test's construction phase progressed through three stages, including (i) First draft of knowledge construction scale in economics (ii) Second draft of knowledge construction scale in economics (iii) Final draft of knowledge construction scale in economics.

First Draft of Knowledge Construction Scale in Economics

In the initial draft, 41 items were drafted as statements. The initial draft of the 41 questions was presented to specialists so they could assess the items' ambiguity, repetition, and content. This is because editing is a crucial step in the Likert scale building process. The first draft of the knowledge construction scale in economics is given in following table-1:

Table 1-Item distribution of three domains of knowledge construction scale in Economics

Sr. No.	Domain	Items	Total
1.	Cognitive	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15,16,17,18.	18
2.	Affective	19, 20, 21, 22, 23, 24, 25.	07
3.	Behavioral	26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41.	16
		Total	**41**

Table-1 displays the distribution of all 41 items: 18 items in the cognitive domain, 7 items were in the affective domain, and 16 items were in the behavioral domain for the initial draft of the knowledge construction scale in Economics.

Table- 2 Positive and negative items distribution for the initial draft of knowledge construction scale in Economics

Statement	Item	Total
Positive Items (+)	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15,16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 33, 34, 35, 36, 37, 38, 39, 40, 41.	40
Negative Items (-)	32	01
	Total	**41**

Table- 2 demonstrates the distribution of all 41 items from the initial draft of the economics knowledge construction scale; 40 of the items were positive, while 1 was negative. For this reason, seven subject matter experts with extensive backgrounds in teaching at the high school, college, and university levels were contacted.

First Try-out and Evaluation - The subject experts were specifically asked to consider each statement carefully and to provide critical, unbiased feedback on what they observed. The researcher and her supervisor spent multiple meetings deliberating over the opinions of the specialists on the claims pertaining to the creation of economics knowledge. A couple of statements were reframed and eight were discarded based on their feedback and assessment. Table-3 presents the distribution of modified and dropped items from the initial draft of the knowledge construction scale in economics.

Table-3 Modified and dropped items distribution of initial draft of knowledge construction scale in economics

Sr. No.	Form of Response	Item Number	Total
1.	Modified Items	17, 18, 22.	03
2.	Dropped items	2, 3, 11, 23, 24, 31, 34, 35.	08

Table-3 demonstrates that of the 41 things in the initial draft, 8 were removed and 3 were changed and reframed. These elements have been revised after thought. The first draft of the economics knowledge construction scale had eight items eliminated. In the end, 33 items were decided upon for the economics knowledge construction scale's second draft.

Second Draft of Knowledge Construction Scale

The second draft of knowledge construction scale in economics consisted of those items which were accepted as such and which were modified or revised taking in consideration the opinions given by the experts. The distribution of positive and negative items for the second draft of knowledge construction scale in economics scale has been given in table-4

Table- 4 Positive and negative items distribution for the second draft of knowledge construction scale in economics

Statement	Item Number	Total
Positive statements (+)	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11,12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 25, 27, 28, 29, 30, 31, 32, 33.	32
Negative statements (-)	26.	01
	Total	**33**

The above table shows that out of the 33 items, 32 positive and 01 negative items were retained for second draft of knowledge construction scale in economics.

Second Try out and Evaluation

The second draft of knowledge construction scale in economics consisting 33 items was administered to a sample of 50 students of class XI of Ajanta Public School, Amritsar and Khalsa College International Public School, Ranjit Avenue, Amritsar for item validity, so as to remove language difficulty, if any. Item analysis usually provided two kinds of information on item such as, item difficulty, which helps us decide if the test items are at the right level for the target group and item discrimination, which allows us to see if the individual items are provided information on candidate's abilities consistent with that provided by other items on the test. The responses of the subjects were scored as per allotted weightage. The weighted score for each item and for each subject were summated. The total scores were used to identify 27% of topics with high scores, or 14 students in the high group, and 27% of subjects with low scores, or 14 students in the low group. They calculated the weighted scores for each item based on their scored responses. The t-test was utilized for item analysis, with 33 items classified as high and low for each group. The discriminating power of each item was determined by computing the t-ratio for both the higher and lower groups. Therefore, the significance of the difference between the means of the scores of the high and low groups was calculated to determine the item's discriminating power, or how well each statement could distinguish between students with high and low knowledge construction scores in economics based on the value of the t-ratio. For the knowledge construction measure in economics, items having a t-value of positive and significant at 0.01 levels of significance were chosen. For the scale, items having a positive t-value and significance at the 0.01 level of confidence were chosen. Even at 0.05 levels of significance, the t-ratio for eight items was not significant. The t-ratios of 33 items have been placed in table-5:

Table- 5 t-ratio of the second draft of knowledge construction scale in economics

Item No.	t-ratio	Item No.	t-ratio
1.	8.24**	18.	4.67**
2.	7.81**	19.	0.22
3.	6.93**	20.	2.55*
4.	7.53**	21.	6.38**
5.	5.20**	22.	4.15**
6.	5.17**	23.	2.50*
7.	0.96	24.	4.71**
8.	1.18	25.	2.62*
9.	2.80*	26.	4.98**
10.	4.33**	27.	7.27**
11.	5.19**	28.	1.77
12.	2.62*	29.	5.28**
13.	3.39**	30.	0.91
14.	1.66	31.	3.11**
15.	7.17**	32.	1.78
16.	4.02**	33.	1.44
17.	3.36**		

*** Significant at 0.01 level*

(Critical Value 2.06 at 0.5 and 2.78 at 0.01 levels, df 26)

Table- 5 demonstrates that 25 items were found to be significant at either the 0.05 or 0.01 levels of significance, whereas the t-ratio for 8 items, including 7, 8, 14, 19, 28, 30, 32, and 33, was not found to be significant even at the 0.05 level of significance. In the end, 25 elements were kept for the final draft of the knowledge construction scale in economics, whereas 8 items were removed from the original 33.

Final Draft of Knowledge Construction Scale in Economics

The final draft of knowledge construction scale in economics consisted of 25 items. The distribution of positive and negative items in the final draft of knowledge construction scale in economics is given below in table 6:

Table-6: Showing distribution of positive and negative items for the final draft of knowledge construction scale in economics

Statements	Item No.	Total
Positive Items (+)	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 23, 24, 25.	24
Negative Items (-)	22	1
	Total	**25**

Table-6 shows that out of a total 33 items, 25 were retained for the final draft of knowledge construction scale in economics. It includes 24 positive and 1 negative item.

Scoring

Each item has a response option on Likert's five points continuum viz., Strongly Agree, Agree, Undecided, Disagree and Strongly Disagree with

respective weights of 5, 4, 3, 2 and 1 for the positive statements and 1, 2, 3, 4 and 5 for the negative statements. The scoring procedure adopted is presented below in table-7.

Table-7: Scoring Procedure for each item of students satisfaction scale in economics

Items	Scores Assigned				
	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
Positive Items (+)	5	4	3	2	1
Negative Items (-)	1	2	3	4	5

Table-7 illustrates that the subject's knowledge construction score is the total of each statement's item scores. The range of scores is 25 to 125 for this scale. A high knowledge construction score in economics correlates with a high score on the knowledge construction scale, and vice versa.

Reliability

The test measures' dependability can be established in a variety of ways. Guilford (1967) proposed a variety of approaches to assess reliability, including test-retest, alternative forms, and internal consistency (or just internal consistency). All of these techniques follow the same steps, which include obtaining two sets of measurements from the same scale and giving them to the same sample in order to calculate the reliability coefficient. The logical arrangement of the components and the diverse character of the scale prevented the two parts from being comparable. Consequently, it was discovered that the test-retest reliability criteria was the most appropriate for assessing the dependability of this scale. The reliability coefficient of the final draft of knowledge construction scale in economics is found to be 0.71. Thus the final draft of knowledge construction scale in economics is found to be reliable.

Validity

A scale's content validity is ascertained by methodically assessing the content of the test. Experts were shown the tool in order to get their opinion on its validity, and those items were included upon which they all agreed. In addition, the scale's items were chosen after a thorough examination of the concepts of knowledge construction and all of its facets; as a result, the scale has a respectable level of content validity.

Conclusion

Knowledge construction scale was developed by the investigator to know about the level of knowledge of students in the subject of Economics. In particular this scale was constructed and standardized for the students of XIth class. During the research, investigators felt the need for construction of this test due to the non-availability of knowledge construction scale. Another reason for the construction of this test was the learning environment of students. In keeping mind both the points scale were constructed and standardized by following all the scientific steps of construction and standardization of reliable research tool. The final knowledge construction scale consists

of 25 items, 24 items are positive and 1 is negative.

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