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How Do Teachers Interpret The Term 'Constructivism' As A Teaching Approach In The Riyadh Primary Schools Context?

Khalid Alsharif

King Saud University, Riyadh, Saudi Arabia

Abstract

The constructivist view of learning has been receiving a great deal of attention in the last three decades, because of its impact on science and mathematics education. However, while many educators stressed that there is a difficulty in translating a constructivist theory of learning into the practice of teaching, constructivism helps inform teaching and reminds educators that the learner must be at the centre of pedagogies. This paper report on a study designed to investigate the application, or possibility for the application, of constructivism in Riyadh primary mathematics classes. A survey was conducted to find out how teachers in Riyadh interpret the term constructivism as a teaching approach. Altogether 136 responses, 98 for mathematics teachers, and 38 for pre-service teachers participated in the survey. The instrument used to collect data is a published questionnaire called “The Constructivist Learning Environment Survey (CLES)” with three additional scales added taken from “What is happening in this Class Questionnaire”. In this study and after analysing the data, it is apparent that all correlation coefficients have statistical significance at level 0.01, which indicates very satisfactory internal consistency for all scales, and were fluctuated from 0.57 to 0.84. The results found were that primary mathematics teachers in Riyadh are concerned with helping students learn and like working with students. However, often demanding silent classrooms, they have limited understanding of constructivism class control. Furthermore, teachers do not seem to have confidence in a classroom environment where student prior knowledge is evaluated and built on.

Keywords: Teacher Education, Mathematics Education, Constructivism, Teaching and Learning, Pre-Service Teachers;

1. Introduction

The constructivist view of learning has been receiving a great deal of attention, because of its impact on science and mathematics education. Treagust, Duit, and Fraser (1996, p. 3) wrote, “The constructivist view has become a most powerful driving force in science and mathematics education, particularly during the past decade”. 

Corresponding Author: Khalid Alsharif
E-mail: khalidalsharif@gmail.com
Goodell (2006) stressed that the application of constructivism to mathematics teaching began in the 1980s, and has remained a topic of extensive discussion ever since. Constructivism is a theory about learning and about how people acquire knowledge (Kroll, 2005). Much of the popularity of constructivism in the last 20 or 30 years has come from the dissatisfaction with the results of teachers and the traditional education system, mainly because students are not graduating with satisfactory skills in reading, writing or mathematics (von Glasersfeld, 1995). Constructivist theory seems to be a refreshing way to perceive how people learn and understand (von Glasersfeld, 1995).

Bodner (1986) highlighted the difference between the traditional view of knowledge and the constructivist model. The traditional view of knowledge is based on the common sense belief in the existence of a real world whether we notice it or not. In addition, the constructivist model assumes that knowledge is constructed in the mind of the learner. This difference in perception towards knowledge led to a change in teaching strategies in classroom. Teachers do not need to feed students information; teachers should encourage students to use their own thought processes to construct knowledge and solve problems. The key to learning, in a constructivist model, is for the learner to find multiple ways to link new knowledge or meaning to previous cognitive experiences. Tobin and Tippins (1993) point out that in shifting the teaching approaches from teacher-centred to be more student-centred the learners construct knowledge depending on their experience. Ariasian and Walsh (1997) identified three reasons for the popularity of constructivism in teaching. First, it enables schools to promote higher-level learning outcomes by encouraging their students to construct their own meanings and interpretations. Second, it assumes that all students can and will learn as they acquire and build their own personal knowledge. Third, it gives teachers more discretion to construct their own meanings and interpretations in order to improve classroom teaching and learning.

For most teachers, their knowledge of constructivism is limited to the saying "students construct their own knowledge" (Cobb, 1994, p. 4). However, there is more to constructivism than a simple change of words from learn to construct. The central belief of constructivism is the facilitation of a student-centred classroom with a focus on the prior conceptions and values of the student. Hiebert and Grouws (2007) noted that within mathematics, theories of teaching have been less clearly articulated than theories of learning. “Although theories of learning provide some guidance for research on teaching, they do not translate directly into theories of teaching.” (Hiebert & Grouws, 2007, p. 373). Richardson (1997) stressed that there is a difficulty in translating a constructivist theory of learning into the practice of teaching. Ariasian and Walsh (1997) pointed out the difference between the theory of constructivism and its practical application. They advise teachers who attempt to implement constructivism in their teaching practices that there is no single instruction of constructivism that can be readily applied in classrooms. Teachers should not fall into the trap of believe that students construct meanings by only constructivist instruction techniques (Ariasian & Walsh, 1997). Different learning goals therefore, need different teaching methods (Hiebert & Grouws, 2007).

However, while constructivism is not a theory of teaching, it helps inform teaching and reminds educators that the learner must be at the centre of pedagogies (Kroll, 2005). Constructivism therefore seems to be a powerful alternative to direct instruction (Confrey, 1990). Several studies have focused on constructivist theory-based teaching in science and mathematics in a variety of school situations (Wheatley, 1991; Yager 1991, Shifter & Fosnot, 1993; Wooten 1998; Ziegler & Yan, 2001). Many of these studies have shown the effectiveness of constructivist models of teaching to achieve learning. These positive effects of constructivist teaching are also noted in mathematics teacher education programs (Klein, 1999; Ebby, 2000; McDuffie, 2004; Goodell, 2006). According to Confrey and Kazak (2006), teacher education has been dramatically affected by the theory of constructivism. “Constructivist ideas have spawned hundreds of books and articles and currently influence classroom teaching practices and teacher education techniques (Oxford, 1997, p36). The centre of attention moved from the theory of learning to considering pedagogical practice. It is clear that there is a shift to a focus on how students learn how teachers teach.

In Saudi Arabia and a part of the reason for this research was the national initiative to renew teaching and learning in mathematics classrooms. A report prepared by a team of educator supervisors in the Ministry of
Education (2000) stated that the teaching methods used within the Saudi classrooms often were based on traditional teaching that focused on memorization of facts and the development of routine techniques and failed to assist students to develop deep understandings and higher order thinking. Interestingly, in the last ten years in Saudi Arabia, there has been a surge in the amount of education research conducted in the field mathematics education. Notable areas of research focused on improving teachers' pedagogies. That was because many mathematics teachers still used teacher-centred approaches in teaching mathematics in Saudi classrooms and did not help students to engage in higher order thinking (Bader, 2004; Alfarhod, 2009). Albalawi (2010) identified eight main areas of research in teaching and learning mathematics in Saudi Arabia in order to help researchers to direct their research to the most critically needed areas of research. He pointed out that, currently, professional development for in service mathematics teachers was the highest priority areas for research. This study was conducted as a result of these major concerns, and the focus on improving teaching and learning mathematics in Saudi classrooms which is, arguably, parallel to the international concerns that advocated a shift from the traditional teacher-centred approach towards more active involvement of the learners (Australian Education Council, 1991; NCTM, 2000).

2. The study

Learning environment research becomes well established and worldly recognized over the last decades. Thus learning environment research approaches and instruments provide a way of assessing and investigating important aspects of learning environment that play a major role in students outcomes. The questionnaire used in this study is a composite, mainly of the Constructivist Learning Environment Survey, CLES, by Taylor, Fraser, and Fisher (1997) and three scales from the What is Happen in This Class, WIHIC, questionnaire by Fraser, McRobbie, and Fisher (1996). The CLES enables researchers to monitor the development of constructivist approaches to teaching school science and mathematics (Taylor, Fraser, and Fisher, 1997). The CLES has 30 items (5 scales with 6 items in each scale). The scales are Personal Relevance (PR), Uncertainty (U), Critica Voice (CV), Sharing Control (SC), and Student Negotiation (SN). The instrument has been cross-validated in many studies in Australia and Taiwan (Aldrige, Fraser, Taylor & Chen, 2000), the USA (Nix, Fraser & Ledbetter, 2005), Korea (Kim, Fisher & Fraser, 1999), and South Africa (Aldrige, Fraser & Sebela, 2004). Regardding the WIHIC instrument, it used to assess students’ perceptions of the class as a whole. The WIHIC has 54 items (8 scales with 7 items in each scale). For this study, three scales were selected from WIHIC and these are Teacher Support (TS), Investigation (I), and Cooperation (C). The number of items in the CLES is five per scale and the number of items in the WIHIC is seven per scale. Therefore, the number of items was reduced to five according to the concept to be applied in Saudi Arabia. Each item in the both instruments has a five-point response scale to choose from (Almost Never, Seldom, Sometimes, Often and Almost Always).

After the preparation of the questionnaire, it was translated to Arabic Language and re-translates the questionnaire once more to English to be reviewed and compared to the original copy. The questionnaire was printed over 200 copies, and then distributed to teachers. Regarding sample selection, around fifty student-teachers were randomly selected from Riyadh Teachers’ College, and more than one hundred qualified teachers were non-randomly selected, based on geographical location, from thirty-five primary schools in the north, west, east, south, and the center of Riyadh. Hence, 98 questionnaires were gathered from 35 schools. Also, 38 questionnaires were collected from student-teachers at the Teacher's College in Riyadh. Surveys found to be incomplete were not included.

Table (1) Distribution of the sample according to their type.

| Type          | No. | %   |
|---------------|-----|-----|
| Teachers      | 98  | 72.1|
| Student teachers | 38  | 27.9|
| Total         | 136 | 109 |

The table above shows that teachers were 72% from the sample, while the student teachers were just 28%. That because the study is focusing on how teachers interpret the term constructivism as a teaching approach in the Riyadh primary schools context and experienced teachers may have a better understanding of the classroom situations.
3. Results

In this study and after analyzing the data, it is apparent that all correlation coefficients have statistical significance at level 0.01, which indicates very satisfactory internal consistency for all scales and were fluctuated from 0.57 to 0.84. This means that all items in each scale were presented one idea, therefore, showing that it made sense to the respondents. Whereas the total reliability coefficient was 0.92, which is a very high coefficient.

The items given on all scales an equal weights according to Likert scale of the five degrees as follows: Almost always, Often, Sometimes, seldom and Almost never. The highest grade given 5 degrees, the lowest grade given one degree, the degrees sorted in descending order (1,2,3,4,5). The range was calculated for the scale where the range = 5-1=4, by dividing the range by number of categories (5) resulted 4/5 = 0.80 which the length of each category of the five scales, then the length of the category is added to the lowest grade of the scale which is the number (1). So the first category is produced to be (1-1.80) and by adding the length of the highest limit for the category to produce the second category and so on for the rest of the categories. Analyzing the results informs us to what extent a constructivist approach is applied in the classroom of the teacher. A close match between teachers' perceived classroom environments and the highest grade, "almost always," would suggest that teachers had experienced an optimal classroom environment for constructivism to occur. On the other hand, a large disparity in the two sets of results, "almost never" would suggest a high degree of dissatisfaction with the constructivism environment.

3.1 Distribution of the sample according to their responses to the all scales

In figure 1, related to sample responses to all scales, we found that the score of personal relevance scale (PR) was 2.5 which is too low comparing with the score of teacher support scale (TS) which is 4.5. While the other scores of all scales were in the range of 3 and 3.5.

In this paper we will discuss in more details the two scales that have highly and lowly ranked elements in regarding the responses scores which were the PR and TS scales. However we provided some details regarding all scales to show the complete picture of the sample responses of this study. In the previous chart we found that the most common answer for uncertainty was "sometimes". Teachers in Saudi primary schools seem to be providing limit opportunities for students to experience mathematical knowledge arising from theory-dependent inquiry involving human experience and values. While students had too little opportunity to learn that mathematics is influenced by people's values and opinion, item 2, students appear to have more chance to learn that modern mathematics is different from the mathematics of long ago, items 4. Also, in a related to critical voice, we found that
most common answer was often. This result demonstrates that teachers allow students to express their opinions, item 5, and complain about anything which may prevent them from learning, item 4. However, they have limited opportunity to complain about activities that are confusing to them, item 3. This result indicates that teachers seem to provide a good social climate in which students feel that it is beneficial to question the teachers about plans and methods that affect their learning. It seems that teachers want to improve their learning environment by trying to listen to their students as a means of providing the best ways to teach the content. However, the sentiment of trying to improve the classroom has not been enough to develop a good teaching approach to teach mathematics in primary school. The feeling of wanting to improve teaching needs to be spearheaded by greater sharing of control with students in the classroom and providing opportunities for students to negotiate and speak out. However, from the previous chart we found that the most common answer for share control scale was "sometimes". This means that teachers seem to not involve students in the design, delivery, and assessment of their curriculum. They may find difficulty to give students chance to decide which activities are best for the students themselves, item 3, or how much time is needed, item 4. Actually, this result was as expected because the understanding of control the class not clear for the teachers. Teachers are careful about keeping the class quiet all the time. Perhaps, this may be explained why teachers had a lack of confidence and experience in sharing control with students. Thereby, teachers support teacher-centred learning activities. Students should give more opportunities to discuss, explain and reflect their ideas with each other. Jakubowski (1993, p. 1) stressed that “students should ask questions and explain differences in their own understandings”

In the above figures and relate to student negotiation, we found that the most common answer was "sometimes". Teachers seem to not give students opportunity to talk with other students to solve problems or explain their ideas. Although in regarding to investigation and cooperation scales, we found that the most common answer was "sometimes". Students appear to have limited opportunity to develop the skills and processes of inquiry. Furthermore, they have limited use in problem solving and investigation is emphasized. Also, students seem to lack cooperation on learning tasks. This indicated that students in Saudi primary school seem passive in the classroom because the main role goes to their teachers. This teacher-led environment of learning limits opportunity for student negotiation.

3.2 Distribution of the sample according to their responses to the personal relevance scale

The personal relevance scale contains 5 items. Connectedness of school math to students' out-of-school experience is the focus of this scale. Also, the scales deal with making use of students' everyday experiences as a meaningful context for the development of students' mathematical knowledge. Table 2, illustrates the scale items and the mean of the sample responses to all five items. We found that most answers for the personal relevance scale are "seldom". It seems that the results for this scale suggest a general low degree of sustained teacher satisfaction with the classroom activities for the out-of-school lives of the students. It seems that teachers try to teach math as theory, with numbers, and they seem have limited experience connecting what they teach and life into the outside school. In other words, teachers believe the more they present using numbers, the more students will learn.

Table (2) Distribution of the sample according to their responses to the personal relevance scale

| Items                                             | Mean | S.D  |
|---------------------------------------------------|------|------|
| Students learned about the world outside of school| 2.04 | 0.79 |
| Students' new learning started with problems about the world outside of school | 2.66 | 0.93 |
| Students learned how math can be a part of their out-of-school life     | 3.09 | 1.03 |
Students got a better understanding of the world outside of school 2.26 0.83
Students learned interesting things about the world outside of school 2.51 0.90
scale mean 2.51

It seems "the majority" of the mathematics teachers depend on putting down information on the board and asking students to write it into their note books without making a link between the mathematical knowledge and students’ everyday life information. The main reason for this narrow view may due to goes back to the consecration of the knowledge as a cultural valuable that should be transferred from one generation to the next. Although the math textbooks in Saudi primary schools were changed recently to involve the usefulness of mathematics in everyday life, teachers still seem to involve more numbers and theories without linking with students out-of-school lives. This narrows the students' view and limits their thinking of the outside of school. Clearly, we found that one of the lowest results of the personal relevant scale items was number one, "students learn about the world outside of school".

This seems to be a common problem in mathematics education around the world. The importance of linking what students learn in school and their life out of school has been a topic of educational research for nearly a century. In spite of decades of attempted reform in both curriculum and pedagogy in mathematics education, the subject remains a mystery or an ordeal for many students. One of the main reasons for this is the lack of ability of students, and often of the teachers, to see a direct connection between the mathematics studied in school and their concerns outside the classroom. In most schools, achievement is designed simply to record the students’ answers, not their application. However, students must be able to connect the new information with their experience in a way which has value in their lives (Newmann, Marks, & Gamoran, 1996). Hayes et al. (2006) commented that when teachers make the subject matter relevant, they connect classroom learning with the real world processes, and thus make learning more enjoyable. Research shows that students are more likely to continue to study mathematics and put in greater effort to succeed in it based on their perceived value of mathematics and its relevance to their life aspirations as much as on their ability in and enjoyment of it (Luttrell, Callen, Allen, Wood, Deeds & Richard, 2010).

3.3 Distribution of the sample according to their responses to the teacher support scale

The teacher support scale contains 5 items. This scale extent, to which the teacher helps, be friends, trusts and is interested in students. Table 3, illustrates the scale items and the mean of the sample responses to all five items. We found that the most common answer for teacher support scale was often. It means that teachers do seem to be interested in helping students when they have trouble with their work and do appear to consider their feelings. Teachers also indicated that they like to move around the class to discuss matters with students and ask questions to help understanding. This result was positive because if teachers like to help students, naturally, it makes sense to improve teaching methods.

Table (3) Distribution of the sample according to their responses to the teacher support scale

| Items                          | Mean | S.D  |
|-------------------------------|------|------|
| I go out of my way to help students | 3.87 | 0.81 |
In Saudi classroom teachers had good technical skill in relation to helping students to achieve a higher result in mathematics. Interestingly, most supervisors in Riyadh primary schools provide some guidelines to teachers, such as, teachers should not sit down during the class, and teachers should move around the class. These school-based guidelines seem to play a major role in teachers’ answers.

Educators around the world have focused on the quality learning environment. Fraser (2001) asserted that for many educational researchers, student academic outcomes have been strongly influenced by the quality of learning environments. Webster and Fisher (2003) stressed that for many years, the education literature has linked student achievement with a good school environment. Fraser (2001) highlighted “The research shows that attention to the classroom environment is likely to pay off in terms of improving student achievement” (p. 4). Hayes et al (2006) stressed that teachers and students most often identify the supportive classroom environment as an important aspect of a good classroom. Marks, Doane and Secada (1996) found a positive impact on students’ achievement when school and teachers offer a supportive learning environment.

Many researchers have highlighted the importance of a supportive classroom build on teacher-student relationships (Wubbels, 1993; Rawnsley, 1997; Roesser et al, 1996; Wentzel, 1997). Wubbels and Brekelmans (2005) reviewed different studies investigating teacher-student relationship and affective outcomes. They noted that, “from the studies reviewed with respect to student outcomes, appropriate teacher-student relationships are characterized by a rather high degree of teacher influence and proximity towards students” (p. 15).

### 3.4 The difference between means of the teachers and students teachers according to their response to scales items

Table 4 illustrated that the t-test values of the scales according to the responses of teachers and students teacher to the scales item confirmed that there is no significant differences between teachers and students teacher at level 0.05 (p>0.05) and that mean they both agree in their understanding for using constructivism method in teaching and that for scales (3, 4, 5, and 6. Also t-test values for scale (1 and 2) show no significant difference between teachers and students according to using constructivism method in teaching.

| Scale             | Source   | No | Mean | S.D  | t-value | Sig. |
|-------------------|----------|----|------|------|---------|------|
| 1 Personal Relevance | Teacher  | 98 | 2.51 | 0.58 | -0.097  | 0.92 |
|                   | Student  | 38 | 2.52 | 0.6  |         |      |
| 2 Uncertainty     | Teacher  | 98 | 2.8  | 0.75 | -0.278  | 0.78 |
|                   | Student  | 38 | 2.84 | 0.76 |         |      |
| 3 Critical voice  | Teacher  | 98 | 3.57 | 0.81 | 0.905   | 0.36 |
|                   | Student  | 38 | 3.43 | 0.73 |         |      |
| 4 Share control   | Teacher  | 98 | 2.88 | 0.72 | 1.571   | 0.11 |
|                   | Student  | 38 | 2.66 | 0.71 |         |      |
4. Conclusion

These responses suggest that teachers’ perception and capacity to implement constructivism learning environment is unsatisfactory. The environment of school today may not be able to help students build on their prior ideas and knowledge to create clearer understandings of mathematical problems. Teachers and student teachers have problems in understanding the constructivism point of view on classroom control. In other words, teachers seem to give students limited freedom to discuss their ideas. In particular, the results indicated that teachers in their actual classroom environment failed to use every day experiences as a meaningful context to development students' mathematical knowledge (personal relevant). They provided limited opportunities for students to experience mathematical knowledge arising from theory-dependent inquiry involving human values and experiences (uncertainty). They also, provided limited opportunities for students to discuss, negotiate, explain and reflect their own ideas (students’ negotiation). However, mathematics teachers were confident in empowering students, being very frequent in assistance, helping, befriending, trusting and being interested in students (teacher support).

As a limitation of this study, the researcher depended on the view of teachers to study constructivism as a teaching an approach in Riyadh primary schools. However, if the view of students was included, the results would have given a more complete picture of the situation. In fact, improving the learning environment in the classroom involves an understanding of the circumstances and influences of all involved, teachers, students, curriculum and schools.

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