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Effect of Inquiry-based Learning Approach on Student Resistance in a Science and Technology Course*

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Abstract

The aim of this study was to identify the resistance behaviors of 7th grade students exhibited during their Science and Technology course teaching–learning processes, and to remove the identified resistance behaviors through teaching–learning processes that were constructed based on the inquiry-based learning approach. In the quasi-experimentally designed study, data were collected from 95 students and 14 teachers using both qualitative (students' follow-up forms, observation, and interview forms) and quantitative (achievement test and personal information survey) methods. In the experimental process, courses given to the control group were taught using the traditional method, whereas those given to the experimental groups used an inquiry-based learning approach. When the data, which were collected in the spring term of the 2010–2011 academic year, were analyzed, 25 students were identified as having resistant behaviors such as not participating in the course, not being interested in the course, not taking care of their friends, seeking attention, not respecting the teacher, and providing suggestions to the teacher. The statistical data analysis showed that there was a significant difference between the pre-test and post-test mean scores of both the control and experiment groups; however, the mean scores of the experimental groups showed a greater increase than those of the control group. While the findings derived from the follow-up forms and the analysis of teacher interviews showed that the experimental process changed the resistance behaviors of students in a positive way, this change was not permanent at the end of the experimental process. As a result, it was found that students can have a variety of resistant behaviors and these behaviors can be affected positively by different teaching methods that are accepted as effective in that discipline.

Keywords

5E Learning Cycle, Elementary Education, Inquiry-based Learning Approach, Science and Technology Course, Student Resistance.

The need for individuals literate in science and technology who will carry their societies into contemporary civilization has been understood by the international education community. The vision of a Science and Technology Course Program, which was first implemented in the second level of primary schools in the 2006–2007 instruction year in Turkey, was determined to be educating all students as science and technology literate individuals without regard to their individual differences. Educating

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individuals to be literate in science and technology is ensured by effective science and technology teaching. In the inquiry-based learning approach suggested by educational scientists, learners master learning units by obtaining data through asking questions and doing research in the knowledge construction process, using their creativity (Bass, Contant, & Carin, 2008; Burden & Byrd, 2003; Hassard & Dias, 2008; Haury, 1993; Hogan & Berkowitz, 2000; Howe, 2002; Karamustafaoğlu & Yaman, 2006; Keys & Kennedy, 1999; Lawson, 2010; Lindberg, 1990; Llewellyn, 2002; Lloyd & Contreras, 1987; Marek & Cavallo, 1997; Martin, Sexton, Franklin, & Gerlovich, 2005; Narode, Heiman, Slomianko, & Lochhead, 1987; National Research Council, 2000). Inquiry-based learning, which is based on a constructive approach and the learning cycle model and is suitable for all education levels, also allows students to evaluate their own progress (Hammerman, 2006; Kanlı, 2009; Llewellyn, 2002; Office of Science Education National Institutes of Health, 2006; Peters & Stout, 2006; Temizyürek, 2003; Wenning, 2005). Thus, effective teaching can only be assured when teaching approaches, methods, and techniques are applied considering the course structure (Kaptan & Korkmaz, 2001). In addition to this, affective problems that could have a negative impact on learners or teachers in the learning environment need to be resolved. Student resistance behavior is an affective problem perceived as oppositional behavior toward instructional activities, but it differs from unwanted student behaviors that are found in today's learning environments, as it affects each component of the teaching–learning process negatively (Burroughs, Kearney, & Plax, 1989; Giroux, 2001; Sağlam, Vural, & Adıgüzel, 2007; Whiteneck, 2005). Sources of resistance behaviors are identified in the literature as direct instructions from the teacher, insufficient learning experience, lack of self-confidence, low academic achievement, unfair behaviors toward students, learning environments in which racial and cultural issues are prioritized, and the use of inappropriate instructional methods for students' learning styles and backgrounds (Alpert, 1991; Brookfield, 2006; Goodman, 2007; Güven, 2004; Field & Olafsen, 1999; Haddad & Lieberman, 2002; Higginbotham, 1996; Leamnson, 1999; Paulsen & Chory-Assad, 2005; Reichert, 2007; Yüksel, 2003). Although resistance behaviors are usually perceived as oppositional behaviors, they can sometimes lead to the improvement of the teaching–learning process because the resistant students complain about improper instruction (Burroughs et al., 1989; Lindquist, 1994).

Purpose

The purpose of this study was to identify the effect of the inquiry-based learning approach on the resistance behaviors of 7th grade students' in science and technology courses.

Method

Research Design

The study was designed as quasi-experimental research. As the quasi-experimental design allows the selection of more than one experimental group with random assignment, a "nonequivalent control group" was preferred (Balcı, 2006; Campbell & Stanley, 1966; Cohen, Manion, & Morrison, 2007; Creswell, 2009; Gay, Mills, & Airasian, 2006; Karasar, 2009; Neuman, 2009; Robson, 2002).

Universe and Sampling

The theoretical universe of this research was elementary school students in Turkey, and a purposeful sampling strategy was used. According to this method, 95 7th grade students were determined as the sample. In purposeful sampling, members of the sample must meet certain criteria established by the researcher based on the research questions (Creswell, 2009; Huck, 2008; Yıldırım & Şimşek, 2006). In this study, the sample was determined in light of two main criteria. The first criterion was the socio-economical levels of the families of the resistant students. The second was the maturity of the 7th grade student, as they needed to be mature enough to take responsibility for their behaviors (Senemoğlu, 2003; Woolfolk, 1998).

Data Analysis

Quantitative Dimension: In the qualitative dimension of the research, an achievement test was administered. In the development procedure of the test, a pre-application was carried out, and the test questions were determined based on the item discrimination index (Atılgan, 2007; Özçelik, 2010; Tekin, 2008; Turgut, 1995). To analyze the data collected from the achievement test, ANOVA was carried out as a means of identifying the relationship between multiple variables (Akbulut, 2010; Hancock, 2004; Huck, 2008).

Qualitative Method: A content analysis method was used to analyze the qualitative data of the observations and interviews. NVivo 9.0, a

qualitative data analysis computer program, was used to identify the major themes.

Results

In the study, according to the findings of the observations and the interviews with 14 teachers, 7 students in the control group and 9 students in each experimental group were identified as showing resistance behaviors. Among the students showing resistance behaviors (e.g., not participating in the course, not interested in the course), a few also showed additional resistance behaviors like not taking care of their friends, seeking attention, not respecting the teacher, and providing suggestions to the teacher. According to the findings derived from the interviews with all of the participating teachers, in addition to these resistance behaviors, students with resistances often showed the resistance behavior of not fulfilling their responsibilities.

The findings derived from the participants' responses on the follow-up forms and the analysis of video recordings showed that the inquiry-based learning approach had, for the most part, a positive influence on the students' resistance behaviors.

Regarding the effect of the inquiry-based learning approach on students' academic achievements, there was a significant difference between the pre-test and post-test mean scores in both the control and experiment groups. However, the mean scores of the experimental groups showed a greater increase in comparison to the control group scores.

In the interviews conducted with the aim of identifying the effect of the experimental process on student resistance behaviors, the teachers agreed that the inquiry-based learning had changed students' resistance behaviors in a positive way. On the other hand, they indicated that these positive changes did not persist as expected in the teaching–learning process.

Thus, overall, it can be stated that the inquiry-based learning approach used in science and technology teaching has a positive effect on student resistance behaviors.

Discussion

The study identified student resistance behaviors through observations and interviews. These behaviors included not participating in the course, not being interested in the course, not taking care of friends, seeking attention, not respecting the teacher, and providing suggestions to the teacher, as consistent with previous findings in the literature (Burroughs et al., 1989; Kearney & Plax, 1992; Miles, 2007).

When the effects of the experimental process on resistant students' academic achievement, resistance behaviors, and views about the teaching–learning process were analyzed based on the data gathered via the pre- and post-achievement test, student follow-up forms, video recordings, and student interviews, it was found that the experimental process had a greater influence on the achievement scores of the experimental groups in comparison to the control groups. Findings based on the follow-up forms and video recordings showed that the students' resistance behaviors were affected positively during the experimental process. In the interviews, when the students were asked about their positive and negative views on the experimental process, they indicated that they enjoyed conducting experiments the most, and in general, they did not give negative feedback.

For the third research question, science and technology teachers were asked to identify the effect of the experimental process on students' resistance behaviors. Although it was found that the experimental process had a positive influence on students' resistance behaviors, the changes were not persistent.

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