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Effect of Educational Coaching Uniquely Designed with the GROW Model in Science Teaching on Motivation toward Science and Achievement

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Abstract

This research aimed to investigate the influence of educational coaching that was uniquely designed with the GROW model in science teaching on the motivation and success levels of 7th-grade students in science lessons. The investigation was implemented with 7th-grade pupils in a middle school in Turkey in 2024 and lasted 14 weeks. The investigation was performed using a quasi-experimental, pretest-posttest control group experimental design. Measuring instruments (Scale of Motivation for Science Course-Science Achievement Test) were used as pre-, post-, and follow-up tests. The pupils' success in the science lesson was also evaluated by comparing their lesson grades in the first and second semesters. Students in the control and experimental groups received student-centered training; however, those in the experimental group also received 20 minutes of face-to-face educational coaching every week. During the educational coaching process, activities were performed for students to know themselves, see their weaknesses and strengths, strengthen their weaknesses, reveal their potential, identify factors that have a negative effect on motivation, learning, and achievement, and overcome them. At the start of the research, pupils in the control and experimental groups had like achievement, science scores, and motivation. However, at the completion of the study, the success-motivation points and science grades of the pupils in the experimental group were meaningfully greater compared with those in the group under control. Additionally, pupils in the experimental group had meaningfully higher achievement and motivation follow-up test points than those in the control group. Stated differently, educational coaching, uniquely designed with the GROW model, had a meaningful influence on the rise of motivation and achievement levels in science. Based on the study results, educational coaching should be comfortably included in the science teaching process.

Keywords: Coaching, Educational Coaching, Science Education, Motivation, Success

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Introduction

Traditional teaching methods are being replaced by modern, age-appropriate teaching strategies based on scientific and technological advancements. New ideas and methods are introduced due to the shift to training and education methods that are parallel with advances in science and technology. Coaching is one of these concepts (Karabacak, 2010). Coaching is an effective practice that helps people accomplish their goals and promotes learning and self-improvement. To accomplish objectives that are mutually agreed upon, coaching is a reciprocal sharing of experiences and viewpoints among the coach and the human being coached (Çatalbaş, 2016). People can enhance their performance, learn new abilities, and improve their learning processes through the process of coaching (Özbay, 2008).

The aim of coaching is to increase people's capability and learning capacity; it employs techniques such as motivation and effective questioning (Landsberg, 1999), and eliminates barriers to achievement (Starr, 2004, p. 10). Coaching refers to guiding individuals in their personal development (Kulaç, 2002, p. 47). Coaching practices, including life-career-executive-educational coaching, have been documented in the literature (Atasayar, Bilgin & Güler, 2010). The examination of the relevant literature has revealed that, whatever its type of coaching, coaching is a technique for awareness-learning-transformation that persons can benefit from both in their educational and business lives. Because of its effects, some developed countries have taken notice of coaching and have adopted the idea of using it commonly in education as part of their educational policies (Can, 2023). Coaching practices such as life coaching, career coaching, and executive coaching have been practiced in Turkey for years; however, the concept of educational coaching has recently been employed in the country (Atasayar et al., 2010). Coaching has emerged as an approach that supports students' achievement in central placement exam processes in the Turkish education system (Can, 2023) and is applied under the names of educational coaching, academic coaching, and student coaching. These concepts are used in place of one another (Karabacak, 2010). The development of students' achievement was not the only aim of the coaching applied in this investigation. As the coaching process helps students learn about themselves, improve their motivation and social development, create active learning habits, and recognize and overcome challenges on their path to success, the term "educational coaching" was addressed in this study. Educational coaching refers to a powerful partnership between a coach and a student in an educational setting to support students' development. Educational coaching enables students to know themselves, set their goals associated with the fields they can improve, and acquire learning skills (Ministry of National Education [MNE], 2019). The purpose of educational coaching is also to aid pupils reach their objectives and enhance their academic performance. Educational coaching is a planned developmental interaction process based on allowing students to explore their strengths-weaknesses and find resolutions to their problems (Çatalbaş, 2016). Coaching support can make it possible to help students become independent learners, open up pathways for them to think in complex ways, and equip them with learning and problem-solving skills for their lifelong learning journey. Providing this support by a coach in an educational setting is critical. The fact that students receive help from an educational coach on the above-mentioned topics will support them in their lifelong development (Tümen Akyıldız, 2019). As a result of the implementation of coaching practices, students will become autonomous individuals who have become lifelong learners, can solve the problems they face, and take responsibility for their behaviors (Demir & Doğanay, 2009). The studies mentioned above show that coaching practices have a crucial role in individuals' journey of learning and development, which was one of the reasons why educational coaching was chosen as the topic of this study.

A coach plays an important role in educational coaching. A coach is a professional guide who acts as a companion in people's personal development journey and assists them in taking action in line with their determined objectives (Köktürk, 2006, p. 52). A coach maximizes a person's potential performance (Whitmore, 2003, p. 8), tries to help individuals achieve their goals, solve their problems, learn and develop, and facilitates problem solving (Hawkins, 2008, p. 32). A coach also continuously observes learners, contributes to their development and motivation, helps them find their objectives, and increases their self-confidence (Çam Tosun & Bayram, 2017). However, an educational coach is

neither a therapist nor a psychologist (Öz, 2015, p. 39). Educational coaches should recommend students to professionals, such as psychologists, when they observe abnormal behaviors in the students they interview. Educational coaching should be considered separate from mentoring, guidance, counseling, and counseling as well as from psychologists (Kalçık, 2017). An educational coach helps students learn about themselves, make the best use of their potential, take responsibility for their lives, and live a happier life (Yazır Özgür, 2012, pp. 9-15) As previous studies have shown, educational coaching is a process in which students know themselves, themes are discussed with students, the goals associated with these theme and actions to achieve the goals are determined, a special study and life plan are prepared for the student, learning deficiencies are identified, learning deficiencies are eliminated, and the obstacles to success-motivation are specified and overcome (Çam Tosun & Bayram, 2017; MNE, 2019).

During the educational coaching, a unique coaching plan has been designed using the GROW model, which was coined with the initials of the terms “Goal”, “Reality”, “Options”, and “Will”. These concepts indicate the stages to be followed in the model. The GROW is a model that can be easily implemented and taught by educators without needing an expert psychologist (Jenkins, 2009; Vardarlıer & Özsürünç, 2019). Because of this, the GROW model was applied in the present investigation. The individual’s goals are the main focus in the goal phase. In other words, the goals, how these goals are achieved, and evaluation points are determined. In the reality phase, issues regarding the objectives are explored, and information about the situation is collected. At this point, raising awareness is more crucial than finding solutions. The options phase involves exploring potential behavior or decision options that will lead individuals to the best solution. The individuals are expected to generate their own options. The last phase will include determining the steps that individuals will take to achieve their goals, investigating potential obstacles, discussing how to overcome these obstacles, and developing an action plan (Grant, 2011; Grant & Greene, 2001; Spence & Grant, 2007). The coach should apply the GROW technique effectively to achieve the goals of educational coaching. Accordingly, the researcher of the present study has received an educational coaching certificate.

The literature includes studies examining the impacts of educational coaching on success-attitude (Bulut, 2019; Kalçık, 2018; Taşkın, 2019; Yüksel, 2017), achievement and test performance (Çatalbaş, 2016), success (Karabacak, 2013), student development self-theory, academic self and achievement (Akdağ, 2024), self-confidence level (Combs, 2015), self-efficacy beliefs (Singley, 2017), self-awareness (Richman, Rademacher and Maitland, 2014). Some studies have also examined the effects of hybrid coaching on learning (Aydoğdu, 2022; Fidan, 2018), cognitive coaching on cognitive awareness and achievement (Ceylan, 2011; Demir, 2009); achievement, attitude and cognitive awareness (Ceylan, 2011), success (Duman, 2013; Tümen Akyıldız, 2015), cognitive flexibility and problem solving skills (Turhan, 2022), and teachers’ professional practices (Bjerken, 2013). In addition, Çam Tosun and Bayram (2017) examined the opinions of teachers and students on student coaching; Pınar (2013) investigated the correlation between classroom instructors’ coaching competencies and pupils’ success in exams.

The conclusions of the abovementioned investigations report the positive influence of coaching practices on achievement. The current investigation is different from the above investigations in some ways. First, in this study, the educational coaching was conducted over the academic semester. Second, this investigation used the GROW coaching model. Third, the goal action and the target action plans were evaluated in weekly interviews during the study, and the students were guided toward their objectives. Fourth, educational coaching forms were used. Fifth, the influence of educational coaching on pupils’ accomplishments in the science lesson was determined using the Science Achievement Test (SAT) and the pupils’ science course grade point averages (SCAG) in the first, and second semesters. Finally, this study examined whether the changes in students’ achievement and motivation were permanent or not using a follow-up test. The literature has indicated that there are very few investigations on motivation, which is one of the goals of educational coaching. Thus, the present investigation investigated the influence of educational coaching on motivation. Based on the reasons mentioned above, this investigation was carried out to examine the influence of educational

coaching, which was uniquely designed with the GROW model in science teaching, on motivation and achievement in a science course.

Method

Design of the Study

The current investigation, which investigated the influence of educational coaching on participants' success and motivation regarding the science course, used the quasi-experimental method because students were not assigned to study groups using random sampling; 7th-grade classes in the educational institution where the study was implemented were included. The data collection tools were used as pre-, post-, and follow-up tests, and there was a control class in the investigation; therefore, it was also a study with an experimental design including pretest-posttest control groups (Karasar, 2016).

Study Groups and Characteristics

There were 16 female-14 male pupils in the experimental class and 17 female-13 male pupils in the control class. All of the participating pupils lived in the central neighborhood of the same district, an indication showing that the control and experimental classes were similar in terms of sex and socio-economic characteristics.

Sampling Method of the Research

The study sample was chosen from the 7th-grade classes that the researcher could easily contact; thus, it can be stated that the study used a convenient sampling method (Büyüköztürk et al., 2016).

Measurement Tools

Scale of Motivation for Science Course (SMSC)

The SMSC designed by Dede and Yaman (2008) was used to analyze the pupils' motivation regarding the science course. SMSC is a five-grade Likert-type scale that contains 23 items. The construct validity of the SMSC was evaluated using an exploratory factor analysis, and it was observed that the SMSC included five factors and explicated 47% of the total variance. The Cronbach's alpha reliability of the SMSC was 0.85. The SMSC was readministered to 319 middle school students after 3 weeks, and the reliability coefficient was found to be 0.82, showing that the SMSC was stable over time. The items in the SMSC included positive (n = 20) and negative (n = 3) statements. Scoring scale for the positive statements in the SMSC was as follows: "Totally Agree:5, Agree:4, Somewhat Agree:3, Disagree:2, and Strongly Disagree:1". Reverse scoring was applied to the items that contained negative statements. Before starting the study, the SMSC was administered to 412 students as proof of the reliability of the study data, and its reliability was calculated as 0.84.

Science Achievement Test (SAT)

The SAT, developed by the investigator, was used to examine the pupils' achievement levels in the science lesson. A four-option multiple test, the SAT covered the 7th-grade science course units of Light and Reproduction-Growth-Development. To analyze the learning outcomes sufficiently, 42 items were selected from the prepared item pool. Two experts examined the SAT using the specification table and evaluated it in terms of content validity and scientific error and, subsequently, needed revisions were made on the SAT. The SAT was administered to eight 7th-grade students to determine incomprehensible expressions, and the test was amended accordingly. The SAT was applied to 344 students who were taught these units, and then item analysis was performed. Items (n = 7) with an item discrimination index value < 0.20 were removed from the test, items (n = 6) with a

discrimination index between 0.20 and 0.30 were subject to major corrections, and items (n = 15) with a discrimination index between 0.30 and 0.40 were subjected to minor corrections. No corrections were made for items (n = 14) with a discrimination level > 0.40. The experts re-evaluated the SAT using the specification table and expert evaluation form in terms of content validity, and based on experts' opinions, it was concluded that content validity was achieved. At the conclusion of the test development, the KR-20 reliability of the SAT, which contains 35 items, was calculated as 0.87. Correct and incorrect items in the scale were scored as 1 and 0, respectively. In the SAT, the unit Light was measured using 19 items, and Reproduction, Growth, and Development, 16 items.

The success of the pupils in the study groups were compared using Science Course Average Grades (SCAG), with SCAG- I for the first semester (before the study) and SCAG-II for the second semester (after the study).

Implementation of the Study

The SMSC and SAT were applied as pretests at the beginning of the study. The units Light and Reproduction, Growth and Development were taught for 14 weeks. The 5 E model of instruction was used in the science education in the investigation groups. The investigator prepared teaching materials were prepared by the investigator before the research was began. In addition, a pilot research was implemented to define the potential issues and take the necessary precautions.

Implementation in the Control Group

The 5 E model, the application model of constructivist learning theory, was used in science teaching for the control group. Engage, explore, explain, elaborate, and evaluate phases forming the 5E model were implemented in a student-centered approach.

Implementation in the Experimental Group

Science lessons were similarly instructed to the pupils in the experimental class using the 5E model, along with educational coaching practices uniquely designed with the GROW. The educational coaching process was designed as follows: One theme was determined each week. “Student Goal and Action Plan” and ‘Student Goal and Action Plan Evaluation’ forms and those specified in the weekly implementation stages were used in the goal stage to determine the students’ goals related to the theme, in the reality stage to explore the problems for the goals, in the options stage to discover the options that will solve the problems, and in the will stage to develop an action plan for students to reach their goals. In this context, 20-minute educational coaching conversations were implemented with each of the pupils every week outside of the course. During the educational coaching, students were helped to get to know themselves, see their strengths and weaknesses, receive guidance to strengthen their weaknesses, and reveal their potential. The students were guided appropriately when they needed support and helped eliminate their cognitive deficiencies. Interactions between the coach, student, and parents were established through educational coaching interviews, and feedback was provided to students and parents. The activities carried out during these interviews for each week are described below. First, the student and his/her parents were informed about the educational coaching process, and an educational coaching agreement was signed between the student, parent, and educational coach. An "Education Coaching File," including the activities carried out, was prepared for each student and submitted to the school management.

A “Coaching Implementation Plan” was prepared for each activity to be done each week. Educational Coach Follow-up Form “Monthly Student Tracking Chart” and ‘Monthly Parent Tracking Chart’ were used for the topic and summary of each interview conducted during the educational coaching process, and ‘Monthly Evaluation Report’ and ‘End of Educational Coaching Process Evaluation Report’ were used for the educational coaching activities.

The following procedures were done every week: A “Student Goal and Action Plan” was made for the goals set at the end of the interviews, and what to do to achieve these goals. An evaluation of “Student Goal and Action Plan” was implemented to establish the achievement status of the goals, the reasons for failing to achieve the goals, and to find solutions to achieve them. All the activities within the educational coaching were specifically carried out in the science course.

In the first week of the coaching process, the students were met; within this context, activities were carried out to get acquainted with and establish a bond with them. Students completed the forms “About Me”, “Personal Development Assessment Form”, “Ideal Me”, and “Getting rid of Monotony”. Based on the data in these forms, students’ strengths and weaknesses were identified. Interviews were also conducted with parents.

In week 2, interviews were conducted to determine learning styles and to raise awareness about effective learning and learning strategies using the “Learning Styles Scale” and the “Multiple Intelligences Assessment Inventory”. Thus, each student’s learning style and, multiple intelligence areas were identified, and the students were interviewed about how they learn best. A road map was drawn with the students on how to study for effective learning. The study of “Attention and Focus while Studying” was also practiced to ensure that students concentrate and focus on studying. In addition, a suitable and flexible “Weekly Life Plan” and “Course Study Plan” based on the needs and characteristics of the students were prepared with the students. Interviews were also held with teachers who were teaching other courses about the students. Parents of the students were provided with a 2-week seminar on educational coaching and students.

In week 3, the “Student Life Circle” was implemented to allow the students to observe the balance/imbalances in their lives and avoid the disruptions they were not aware of. This practice aimed for the students to see their obstacles, set goals, create strategies, and make necessary plans to take action.

Every week: During the educational coaching meetings, “Weekly Life Plan”, “Course Study Plan”, “Subject Gain Deficiency”, and “Number of Solved Questions” were discussed and followed up. Considering the feedback from students, the “Weekly Life Plan” and “Course Study Plan” were updated for each student when necessary.

In week 4, difficulties experienced by the students in their courses were identified using the "Course Circle" and solutions were found. The “Course Topic Circle” was used to determine the issues the students experienced in the subjects of their courses and to produce solutions. “Weekly Life Plan” and “Course Study Plan” prepared with the student in the second week were amended based on the feedback received through “Course Circle” and the “Course Topic Circle”.

In week 5, solutions to the difficulties and problems encountered by the student in complying with the lesson study plan were found using the “Course Study Plan Circle”. Thus, the students’ improvements were closely monitored, and they were allowed to see their deficiencies themselves. The “Weekly Life Plan” and “Course Study Plan” prepared for each student in week 3 were updated based on the information obtained from the “Course Study Plan Circle”.

In week 6, a graphical tool called “Obstacles on the Road to Success” and “Student Success Circle” were developed to identify students’ potential obstacles on their journey to success and determine how they should overcome these obstacles.

In week 7, a “Student Skill Circle” was conducted with the students. In addition, the “Time Stealers and My Time Thieves” study was conducted to raise students’ awareness about how to effectively manage time and eliminate the factors stealing their time. Each parent and other course teachers were individually interviewed regarding the improvement of the students.

In week 8, an investigation was conducted to identify the variables that negatively impact students' motivation and self-efficacy beliefs toward the course and to eliminate these factors. In week 9, "My Stress and Anxiety Sources Circle" was used to determine the factors causing stress and anxiety in students and to eliminate them.

In week 10, the "Stopping Procrastination and Taking Responsibility" study was carried out to examine students' procrastination, laziness, and taking responsibility behaviors, produce solutions for procrastination and laziness behaviors, and to improve taking responsibility behavior.

In week 11, the activities carried out during the 10 weeks of the coaching process were discussed with students. The displacement game was played to enable the students to observe themselves and their behaviors, empathize, and raise awareness about the educational coaching process.

In week 12, students were interviewed about how to cope with game-phone-tablet-computer-social media addiction. The "Effects of Game and Social Media Addiction" form was used for this purpose.

In weeks 13 and 14, the "Student Life Circle" and "Student Success Circle", which were administered in weeks 3 and 6, were readministered by going through each interview. Thus, ensured that the students observed their improvements. Additionally, parents and other course teachers were interviewed regarding the improvements of the students.

The SAT and SMSC were applied to the control-experimental classes as post-tests at the conclusion of the study. In addition, the SAT was readministered 4 weeks after the completion of the study, and the SMSC was readministered 12 weeks later as follow-up tests. The SCAG-II was also collected to evaluate the students' achievement.

Analysis of Data

The investigation's data was examined using the SPSS 22 software. The conclusions of the analysis done to examine the distribution of the data collected from SAT, SMSC and SCAG are displayed in Table 1.

Table 1. Normality Analysis of SAT, SMSC and SCAG Data

Control				Experiment		
	Skewness	Kurtosis	Shapiro W.	Skewness	Kurtosis	Shapiro W.
SAT Pre-test	-0.20	-0.89	0.31	0.30	-0.60	0.42
SAT Posttest	-0.26	-0.43	0.70	-0.50	-0.92	0.10
SAT Follow-up	0.45	-0.86	0.14	0.34	-0.52	0.70
SCAG-I	0.22	-0.80	0.50	-0.04	-0.79	0.67
SCAG-II	0.30	-0.83	0.45	0.14	-0.83	0.76
SMSC Pre-test	0.35	-0.60	0.42	0.27	-0.92	0.37
SMSC Posttest	0.30	-0.55	0.65	-0.12	-0.74	0.57
SMSC Follow-up	0.38	-0.33	0.63	-0.26	-0.89	0.36

Table 1 demonstrates that the skewness-kurtosis coefficients of the SAT, SMSC and SCAG data were ranged from -1.5 to +1.5 and the meaningfulness value of the Shapiro-Wilk test results was > 0.05. These findings showed that the SAT, SMSC and SCAG data were normally distributed (Büyüköztürk, 2016; Kalaycı, 2018).

The control and experimental groups' SAT, SMSC and SCAG points were checked against with the independent groups t-test. The dependent groups t-test was applied to compare the SCAG-I and SCAG-II. The groups' pre-, post-, and follow-up test data were compared using one-factor ANOVA for repeated measures (Büyüköztürk, 2016; Büyüköztürk, Kılıç Çakmak, Akgün, Karadeniz & Demirel, 2016; Kalaycı, 2018; Tabachnick & Fidell, 2013). Eta squared (η^2) was calculated in analyses with significant differences. Based on the value ranges, the effect size was interpreted as follows: low if $0.01<\eta^2<0.06$, medium if $0.06\leq\eta^2<0.14$, and high if $0.14\leq\eta^2$ (Cohen, 1988).

Findings

Findings for the SAT

Table 2. Comparison of SAT Points of the Control-Experimental Groups

Test	Group	N	x̄	S	df	t	p	η2
Pre	Control	30	7.10	3.33	58	0.26	0.80	-
	Experiment	30	6.87	3.69				
Post	Control	30	20.03	6.70	58	-3.19	0.002	0.18
	Experiment	30	25.43	6.40				
Follow-up	Control	30	13.80	6.91	58	-4.29	0.001	0.24
	Experiment	30	20.47	4.97				

The differentiation between the SAT points of the control and experimental classes was not meaningful at the start of the investigation ($t_{(58)}=0.26$; $p>.05$). On the other hand, the experimental class had meaningfully greater SAT posttest ($t_{(58)}= -3.19$; $p<.05$) and follow-up test points ($t_{(58)}= -4.29$; $p<.05$) than the control group. Additionally, since the η^2 values calculated for the SAT posttest and SAT follow-up tests were > 0.14, indicating a high effect size (Table 2).

Table 3. Comparison of the SAT pre-, post-, and follow-up test Points of the Control Group

Variance's Source	Square's Sum	df	Square's Mean	F	P	η2	Difference
BetweenSubjects	1271.956	29	43.861				Post-Pre, Follow up-Pre, Post-Follow up
Measurement	2510.156	2	1719.427				
Error	1736.511	58	29.940	41.92	0.001	0.59	
Total	5518.623	89					

There was a meaningful differentiation among the pretest and posttest points of the control class in favor of the posttest, between the pretest and follow-up test scores in favor of the follow-up test, and among the posttest and follow-up test scores in favor of the posttest ($F_{(2-58)}=41.92$; $p<.05$). The η^2 value was > 0.14, which showed a high effect size (Table 3).

Table 4. Comparison of the SAT Pre-, Post-, and Follow-up test Points of the Experimental Group

Variance's Source	Square's Sum	df	Square's Mean	F	P	η2	Difference
BetweenSubjects	733.122	29	25.280				Post-Pre, Follow up-Pre, Post-Follow up
Measurement	5543.489	2	2771.744				
Error	1569.178	58	27.055	102.449	0.001	0.78	
Total	7845.789	89					

There was a meaningful differentiation among the pretest and posttest scores of the experimental class in favor of the posttest, between the pretest and follow-up test scores in favor of the follow-up test, and among the posttest and follow-up test scores in favor of the posttest ($F_{(2-58)}$=102.449; p<.05). Similarly, the η^2 value was > 0.14, showing a high effect size (Table 4).

Findings for Science Course Grade Averages

Table 5. Comparison of SCAG Scores the Control and Experimental Groups

		N	X	S	Df	t	p	η2
SCAG-I	Control	30	60.33	12.94	58	0.09	0.93	-
	Experiment	30	60.03	11.74				
SCAG-II	Control	30	61.50	12.38	58	-3.18	0.002	0.15
	Experiment	30	70.77	10.13				

No meaningful differentiation was found between the control and experimental classes' SCAG-I at the starting of the investigation ($t_{(58)}$= 0.09; p>.05). Nonetheless, the differentiation between the SCAG-II was significant and in favor of the experimental class at the finishing of the investigation ($t_{(58)}$= -3,18; p <,05). In addition, the η^2 value showed a high effect size (Table 5).

Table 6. Comparison of SCAG-I and SCAG-II Scores of the Study Groups

		N	X	S	df	t	p	η2
Control	SCAG-I	30	60.33	12.94	29	-1.08	0.29	-
	SCAG-II	30	61.50	12.38				
Experiment	SCAG-I	30	60.03	11.74	29	-7.44	0.001	0.49
	SCAG-II	30	70.77	10.13				

There was no meaningful differentiation among the control class's SCAG-I and SCAG-II scores ($t_{(29)}$= -1.08; p>.05); however, the differentiation between the experimental group's SCAG-I and SCAG-II scores was significant and in favor of SCAG-II ($t_{(29)}$= -7.44; p<.05). η^2 value showed a high effect size (Table 6).

Findings for Motivation

Table 8. Comparison of SMSC Points of the Control and Experimental Groups

Test	Group	N	$\bar{x}$	S	df	t	p	η2
Pre	Control	30	73.80	12.16	58	0.15	0.88	-
	Experiment	30	73.30	13.81				
Post	Control	30	74.37	13.06	58	-5.45	0.001	0.34
	Experiment	30	92.77	13.08				
Follow-up	Control	30	74.63	14.85	58	-4.89	0.001	0.29
	Experiment	30	92.97	14.17				

There was no meaningful differentiation among the pretest points of the control and experimental classes ($t_{(58)}$=0.15; p>.05). However, the posttest ($t_{(58)}$= -5.45; p<.05) and follow-up test points ($t_{(58)}$= -4.89; p<.05) of the experimental class were meaningfully greater than the class under control. The η^2 values of the posttest and follow-up test of the SMSC were > 0.14, which indicated a high effect size.

Table 9. Comparison of the SMSC Pre-, Post-, and Follow-up Test Points of the Control Group

Variance's Source	Square's Sum	df	Square's Mean	F	p
BetweenSubjects	15014.933	29	517.756		
Measurement	10.867	2	5.433	0.507	0.605
Error	621.800	58	10.721		
Total	15647.6	89			

No significant differences ($F_{(2-58)}$= 0.507; p>.05) were found among the pre-, post-, and follow-up test points of the group under control (Table 9).

Table 10. Comparison of the SMSC Pre-, Post-, and Follow-up Test Points of the Experimental Group

Variance's Source	Square's Sum	df	Square's Mean	F	p	η2	Difference
BetweenSubjects	13692.989	29	472.172				Post-Pre,
Measurement	7657.689	2	3828.844	84.708	0.001	0.75	
Error	2621.644	58	45.201				Follow up-Pre
Total	23972.32	89					

There was a meaningful differentiation among the pretest and posttest points of the experimental group in favor of the posttest and among the pretest and follow-up test points of the experimental class in favor of the follow-up test ($F_{(2-58)}$= 84.708; p<.05). The η^2 value was > 0.14, showing a high effect size (Table 10).

Discussion

Achievement in Science Course

The SAT and SCAG-I pretest points of the control and experimental classes were similar at the initial stage of the investigation. However, the SAT points of the experimental class were meaningfully greater than those of the control class at the finishing of the study and four weeks after the study. Similarly, the experimental class's SCAG-II points were meaningfully greater than those of the control class at the finishing of the study. Besides, the impact size was also high. These findings can be comprehended as evidence of the positive effect of educational coaching on science lesson accomplishment in the experimental class.

The SAT points of the control class rose meaningfully at the finishing of the study compared to the beginning of the study; however, this increase could not be maintained after 4 weeks. This can be attributed to the fact that achievement is a cognitive feature that can change in a short time. No meaningful increase was determined in the SCAG points of the control class during the study process. It contradictory that the control group's SAT points meaningfully raised during the course of the study, while their SCAG scores did not. This contrast can be explained as follows: The increase in the SAT scores of the control class was related to the fact that they were taught the topics in the SAT for the first time and that the researcher provided student-centered instruction. The reality that there was no meaningful improvement in the control class's SCAG scores can be explained by the fact that the scope of the 7th class science lesson content in the first and second semesters were different, they were taught the subjects for the first time, the SCAG scores of the students consisted of science course first and second written exam and performance grades, and the students' performance and written grades in the first and second semesters were similar.

The experimental class's SAT and SCAG scores increased significantly. This can be because the pupils in this class were instructed on the topics in the SAT for the first time, received student-centered teaching from the researcher, or the positive effect of educational coaching on science course achievement. Both groups' SAT and SCAG scores were similar at the start of the investigation;

however, at the finish of the investigation, the SAT and SCAG points of the experimental class were meaningfully bigger than those of the class under control. Likewise, both groups were provided with the same student-centered teaching processes by the same researcher, and the students were taught the topics in the SAT for the first time. Unlike the control class, the experimental class received educational coaching. Considering this situation, the meaningful rise in the experimental class's SAT and SCAG points could be due to the educational coaching activities, which was the experimental process. This can also be more broadly attributed to the "Student Success Circle" and "Obstacles on the Journey to Success" used to determine the variables impacting the pupil's success, the "Course Study Plan Circle" used to determine the variables impacting the pupil's study plan, the "Course Subject Circle" used to determine the subject-gain deficiencies in science courses, and the "Weekly Life Plan" and "Course Study Plan" used to check that the pupils studied in a planned and organized manner. In addition, the outcomes of the study can be explained by determining students' learning styles and multiple intelligence areas using the "Learning Styles Scale" and "Multiple Intelligences Assessment Inventory" and preparing and following the "Student Goal and Action Plan" about effective learning and learning strategies. In week 8 of the educational coaching, "My Sources of Stress and Anxiety Form" was used to determine the factors that lead to stress and anxiety toward the course and exams, and to eliminate the effects of these factors. Given that stress and anxiety are two factors that have a negative effect on success, this activity might have contributed to an increase in achievement. The literature includes investigations that back up the conclusion of this investigation. For example, Karabacak (2013), Çatalbaş (2016), Yüksel (2017), Kalçık (2018), Bulut (2019), Taşkın (2019) and Aydoğdu (2022) found that student coaching significantly contributed to success in the course. Akdağ (2024), Fidan (2018) reported that coaching practices contributed to learning. Ceylan (2011), Duman (2013), and Tümen Akyıldız (2015) found that cognitive coaching contributed to success. Çam Tosun and Bayram (2017) concluded that student coaching contributed to success according to teacher and student opinions. The results of the studies conducted by Bjerken (2013), Brunner, Artelt and Krauss (2007), Chaplin (2007), Combs (2015), Davis (2020), Dedeche (2019), Oreopoulos and Petronijevic (2018), Robinson and Gahagan (2010), Rinaldi (2013) and Singley (2017) also support the results found in the current investigation. Wolff et al. (2020) and Howlett et al. (2021) reported that student coaching practices contributed to learning goals and metacognitive awareness levels, respectively. All the investigation conclusions above demonstrate that coaching practices have a beneficial effect on achievement. Similarly, the present investigation determined that educational coaching had a beneficial influence on achievement. However, this study differs from the above studies in several ways. First, in this study, educational coaching was conducted over an entire academic semester. Second, the study was based on one of the coaching models (GROW). Third, the goal action plan and the target action plan were evaluated in the weekly interviews and the students were helped to find their strategies in accordance with the philosophy of educational coaching. Fourth, the forms developed for educational coaching were used effectively. Fifth, the effect of educational coaching on science achievement was determined using SAT and SCAG scores. Finally, the persistence of achievement was monitored.

Motivation Toward Science Course

The study groups' motivation levels in science lessons were similar before the beginning of the investigation. However, the motivation levels of the pupils in the experimental class increased meaningfully at the finishing of the investigation. This significant rise may have resulted from student-centered teaching, the science teacher, or the educational coaching practices applied as an experimental procedure. Finishing of the investigation and 12 weeks after the investigation was finished, the motivation points of the pupils in the class under experimentation were meaningfully bigger than those of the pupils in the class under control. Students in both groups were taught science by the same researcher who practiced student-centered science teaching. The different variable here was the educational coaching practices used as an experimental procedure in the experimental group. Considering all these, it can be concluded that the significant increase in the motivation level of the experimental class was not due to student-centered teaching or the science teacher, that is, the researcher's effect but to the educational coaching activities implemented as an experimental process during which the factors that negatively affected students' motivation and their self-efficacy beliefs

toward the course were identified and attempted to eliminate. For this purpose, a "Student Goal and Action Plan" was prepared, implemented, and followed up every week with the "Student Goal and Action Plan Evaluation", which may explain the result of the investigation. No meaningful change was seen in the control class's motivation scores. This could have resulted from the fact that the same science teaching processes were applied by the same science instructor in both the first and second semesters in the control class. An examination of the literature demonstrated that there were very few studies examining the effect of educational coaching on motivation. Sezer (2016) found that educational coaching increased academic motivation, a result that supports the result reached in this study. Sezer's (2016) study differs from this study in that it covered a period of 6 weeks, and student-centered teaching was given to the experimental class while traditional teaching was given to the control class. This leads to the question of whether the improvement in academic motivation was caused by student-centered instruction or educational coaching. To avoid this question and examine the effect of educational coaching in this study, student-centered instruction was applied in both study groups.

Conclusions

This study found that educational coaching, which was uniquely designed with the GROW model, contributed meaningfully to the growth and maintenance of motivation and achievement levels in science lessons. The primary cause for the conclusion can be due to the educational coaching activities carried out for 20 minutes outside the lesson every week. Educational coaching activities performed in the study contributed to students getting to know themselves, seeing their strengths, weaknesses, and deficiencies, strengthening their weaknesses, revealing their potential, completing their cognitive deficiencies, and increasing their learning motivation and self-confidence.

Recommendations

When taking into consideration the positive influence of educational coaching on motivation and achievement, educational coaching should be included in education. Considering the positive effect of educational coaching on motivation and success, educational coaching must be involved in education.

Policy Implications

The results of this investigation provide evidence that educational coaching, uniquely designed with the GROW model, contributes positively to the development of achievement and motivation. With educational coaching activities, students can get to know themselves, see their strengths, weaknesses, and deficiencies, strengthen their weaknesses, reveal their potential, complete their cognitive deficiencies, and increase their learning motivation and self-confidence. In addition, students' interests, readiness, learning styles, and comprehension levels ought to be taken into account, and teaching should be carried out with appropriate learning-teaching processes. With educational coaching, it is possible to reach all students in the classroom, to recognize students, to support students in their education, to equalize opportunities and conditions in the education, to provide ease of learning for pupils, and to develop positive attitudes-motivation regarding the course. In this study, the above-mentioned activities were carried out with educational coaching and the development of each student's learning, and motivation was contributed. Thus, learning opportunities and conditions were equalized for each student.

The educational coaching, which is uniquely designed with the GROW model presented in this study, constitutes a concrete example of educational coaching practice for teachers, pre-service teachers, and researchers. The educational coaching forms developed by the researchers in this study will also help to the implementation of educational coaching activities and the achievement of educational coaching goals. In addition, the educational coaching developed in this study can be taken as a model by educators and educational policymakers, and educational coaching practices can be expanded in schools. In this way, the widespread implementation of educational coaching practices in

schools can contribute to the development of the success and motivation of each student and equality of opportunity in education.

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