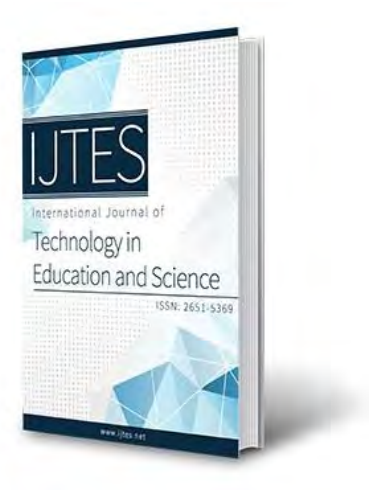

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Student Opinions on Technology-Assisted Drama Activities Applied in a Biology Course: Learning the Central Nervous System

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Abstract

This research aimed to determine students' opinions on technology-supported drama activities applied in teaching the subject of the central nervous system in the biology course. The research used a case study design, a qualitative research method. The study was conducted with 25 students studying biology at a state university. An appropriate sampling method was used to determine the study group. Within the scope of the research, a semi-structured interview form was used to determine students' opinions about technology-supported drama method applications. This form allowed students to express their experiences in depth. The research results indicated that the students had a generally positive perspective on the technology-supported drama method used in the biology course. Since technology-supported creative drama activities provide students with a learning environment that they enjoy, this method can be recommended to increase students' interest in lessons and ensure permanent learning of content.

Introduction

Science and technology form the basis of today's world. The knowledge gained through science and technology from the past to the present is extremely important for the progress of humanity. Science uses systematic experimental methods to understand nature’s working principles and to acquire new knowledge. The information acquired by these methods is transformed into practical applications through technology, making life easier. The continuous and rapid changes in the fields of science and technology lead to the need to train individuals who will adapt to these changes. It is possible through education and training to discover and develop the high-level mental abilities of individuals and to develop their knowledge, skills, and behaviors, enabling them to adapt to changing conditions (Genc & Eryaman, 2007).

The main purpose of teaching is to ensure that the concepts taught are understood and to encourage students to apply this understanding to real-life situations (Nwagbo, 2006). Students need to acquire knowledge through methods other than memorization. Giving information through intensive education that is disconnected from daily life reduces students' interest in the lessons and causes boredom and decreased success (Çam, 2008). Enriching the learning environment with methods of concretization of information related to daily life increases the desire to learn and thus the level of success (Coştu et al., 2007; Karaduman & Emrahoğlu, 2011; Korkmaz & Buyruk, 2016). Students' academic achievement and motivation to learn depend largely on factors such as the teacher's

ability to engage students, the choice of teaching method, and the ability to direct the learning process (Porozovs et al., 2015). For this reason, varied techniques, activities, and approaches are invoked in education/teaching methods (Aydın & Bülbül, 2011). One of these methods is the drama method.

Drama is the use of improvisation, character portrayal, and other theatrical techniques in group work in which individuals assume an experience, an event, an idea, an educational unit, or abstract concepts or behaviors, through "play" processes, observations, feelings, and experiences and the reorganization of old cognitive patterns (San, 2006, as cited in Yenilmez & Uygan, 2010). The use of drama in the classroom is a student-oriented process and a tool that can encourage and develop experiential learning. This method helps students develop their divergent thinking skills, creativity, and cognitive abilities, while also strengthening their oral and written communication skills (Annarella, 1992). An aim of the use of the drama method in education is to enable students to express themselves, learn by experiencing, and aspire to do research (Selvi, 2013). Students become a part of the learning environment with this method. In this way, students have a good time and learn in a more permanent way (Aydın & Bülbül, 2011).

The biology course aims to help students acquire basic biological knowledge and follow scientific developments in this field. It includes subjects that are suitable for role-playing. It is thought that when students act out the events, the subjects become interesting as they move away from abstractness (Aydın & Bülbül, 2011). The literature contains studies on the effectiveness of drama in biology courses. These studies emphasize that students' achievement, competence, independence, and motivation increase as their attitudes toward learning biology change positively with the drama method (Aydın & Bülbül, 2011; Kolovou & Kim, 2020; Saka et al., 2016).

Another method that provides a significant effect in the learning process is technology-assisted instruction. The main purpose of technology in education is to ensure effective and permanent learning by contributing to human development (İşman, 2005). Initially, classrooms were introduced to technology by incorporating existing technological tools such as calculators or overhead projectors into the learning environment (Sevimli & Delice, 2015). Every year students join the classroom armed with new technological tools and extra skills in this field. For example, cell phones and laptops, which were considered luxuries until a few years ago, are now widely used by students. Therefore, the generation's perspective and perception of technology are enriched (Karadüz & Baytak, 2013). The literature contains studies examining the contribution of technology-supported instruction to the biology course (Shim et al., 2003; Tsaushu et al., 2012; Yang et al., 2015).

However, no research has studied the use and effectiveness of both methods employed together in biology lessons. This shows the necessity of examining the effectiveness of these methods in teaching biology. Among the science topics with which students have difficulty are regulatory and supervisory systems (Baş & Karamustafaoğlu, 2020; Güneş & Güneş, 2005). This study aimed to determine student views on technology-supported drama activities applied to teaching the central nervous system in the biology course. Research indicates that using the technology-supported drama method in biology lessons will enable students to actively experience learning processes instead of simply memorizing information. This method can provide students with a more effective learning experience in biology and enable them to actively comprehend information instead of passively receiving it. In this context,

this study is important in presenting a new perspective to guide future studies by reviewing the literature. In this framework, the main problem of the research was formulated as follows:

> After lessons teaching the central nervous system subject with the technology-supported drama method, what are the opinions of the students about this method?

Method

This research is a qualitative study using case study design. Qualitative research is an approach that focuses on understanding a research inquiry as a humanistic or idealistic approach (Pathak et al., 2013). Case study is a research method frequently used in social and life sciences when the researcher focuses on *how* and *why* questions, has limited control over events, and examines phenomena in real-life conditions, but the connection between the event and real life is not clear (Heale & Twycross, 2017; Yin, 1984). Case study is also defined as an intensive examination of a single unit in order to generalize to a larger set of units (Gerring, 2004). This study used the Explanatory Case Study design. Explanatory case studies usually offer a descriptive approach by dealing with one or more situations in detail. Such studies are used to provide information, especially when the reader has limited knowledge of a program or topic. These situations help readers to better understand the subject and interpret similar data (Aytaçlı, 2012). In this research, the use of technology-supported drama method in a biology course was handled as a case and the opinions of the students who participated in this method were collected.

Participants

This study was conducted in the 2022-2023 academic year with 25 second-year students studying biology at a state university in Turkey. Convenient sampling method was used to determine the study group. Convenient sampling method is the selection of the sample from easily accessible and applicable units due to limitations in time, money, and personnel (Büyüköztürk et al., 2012). The main purpose of this sampling method is to increase the practicality and speed of the research by choosing groups that are close and easily accessible to the researcher (Yıldırım & Şimşek, 2006). Selecting samples from easily accessible units makes the research process more efficient and simplifies the application process, decreasing the time and effort spent on sample selection and obtaining the results faster. The sample group consisted of 15 female and 10 male students whose participation was voluntary. The average age of the participants varies between 18-22. The ethical and administrative permissions required for the research were obtained. Since the number of students taking the biology course was limited and only one instructor was allowed to practice in his course, the sample of the study was limited to second-year students taking the biology course. In addition, the fact that the sample consists mainly of women is a limitation of this study. In a total of 6 hours of lessons over 3 weeks, the subject of the central nervous system was taught with technology-supported drama method.

Data Collection Tool and Process

In the study, a semi-structured interview form was used to determine students' views on technology-supported drama method applications. This form was prepared by the researchers through a literature review. The questions

in the form were presented to two experts in the field of biology education and evaluated in terms of clarity, comprehensibility, and scope. Using the experts' feedback, some questions were revised and rearrangements were made. The interview was applied to two students as a pilot study and the form was finalized. The five open-ended questions in the interview form were carefully selected to serve the general purpose of the study. Following qualitative research techniques, face-to-face interviews were conducted with the participants. In the first week, the students were given comprehensive information about the technology-assisted drama method and they determined which roles they would play to dramatize the central nervous system topic. In the second week, efforts were made to ensure the students' effective participation in the drama activities in the classroom, and they treated the topic with creative drama techniques and interactive technological tools. In the last week, the students were divided into groups that evaluated the method applied, holding discussions about the parts of the central nervous system. After three weeks, all students were interviewed face-to-face by the researchers and the interviews were recorded with a voice recorder for the reliability of the data. Each student was interviewed for approximately 15 minutes. Data were collected in January 2024.

The questions in the interview form are the following:

1. What do you think about the use of technology-supported drama in the biology course?
2. What do you think is the biggest advantage and disadvantage of using this method? Can you explain with the reason?
3. What are your thoughts about the duties and responsibilities of teaching the course with this method?
4. In your opinion, in which other courses should the technology-supported drama method be used?
5. Please indicate what you would like to add and your suggestions.

Data Analysis

The data analysis process took place in three stages. First, the audio recordings were converted into written texts. These texts were analyzed through content analysis, a method to analyze various types of data, including visual and verbal data. This method enables better analysis and interpretation of phenomena or events by reducing them into defined categories (Harwood & Garry, 2003). Content analysis, which includes the scientific examination of communication content, refers to the detailed examination of the content based on the meanings, contexts, and intentions contained in the messages. This method can be used to reveal the factors underlying communication processes and messages while providing researchers with in-depth content understanding (Prasad, 2008). In the next stage, the data were analyzed and potential codes were identified. For each item, the categories to which the relevant codes would be assigned were determined. In the last stage, the data obtained were tabulated and interpreted. Throughout this process, ethical rules were followed and the confidentiality of the sample group was protected. Each student was numbered.

Validity and Reliability

Construct validity of case studies is achieved by creating a chain of evidence based on the data collected. Internal validity is achieved by presenting the results in a clear and understandable way, with conclusions that are easily

accessible to others. External validity is achieved by proposing a theory or conceptual model based on the results obtained. Reliability is ensured by clearly presenting the research processes step by step (Yıldırım & Şimşek, 2005:288; as cited in Yaman & Erdoğan, 2007). Specifying the method and implementation steps of the study clearly, and in detail, is an important step that increases the reproducibility of the study and strengthens the level of validity and reliability (Yıldırım et al., 2014). In the current study, data were obtained using a semi-structured interview form. Presenting the research processes step by step and in detail provides confidence in the reliability and validity of the research.

Results

The findings collected from students' opinions about technology-supported drama practices are presented as a compilation of coded responses and quotations from students. The ideas expressed by the students in answer to any question were placed under more than one code. Each student was numbered.

Table 1 shows the codes related to the question "How did you find our teaching of biology course using technology-supported drama method?"

Table 1. Students' Opinions on the Question "How Did You Find Our Teaching of Biology Course Using Technology-Supported Drama Method?"

Codes	**Participants**	**N**
Fun	S1, S2, S3, S12, S13, S14, S15, S16, S17, S18, S19, S20, S25	13
Persistence	S3, S8, S11, S19, S20, S21, S22, S23, S25	9
Utilizing Technology	S7, S12, S21, S24	4
Learning	S5, S9, S11, S18	4
Subject Comprehension	S9, S10, S20	3
Productivity	S1, S2, S8	3
Creative	S3, S6, S24	3
Waste of time	S4	1
Fluency of the Course	S7	1

Examples of the statements of the students who expressed their opinions on this issue are presented below.

> *"Before the application, there were times when I was bored in class. Since it was a different method, it made the lesson more fluent. At the same time, using technology in the lesson made me more enthusiastic about the lesson." (S7)*
> *"I think it is a very good practice in terms of comprehension and making the information permanent, we enjoyed it, we had fun and lessons should be taught in this way." (S20)*
> *"It was memorable and helped me learn." (S11)*
> *"It was a fun lesson, we learned more easily because it was fun." (S18)*

Table 2 shows the codes related to the question: "What do you think is the biggest advantage and disadvantage of teaching the course with this method? Can you explain with the reason?" These codes are as follows: enjoyable/entertaining, permanence, active participation, motivation, visualization, no need for memorization, attention-grabbing, theater ability, success, self-confidence, comprehensibility, time, lack of materials.

Table 2. Students' Opinions on the Question "What Do You Think is the Biggest Advantage and Disadvantage of Teaching the Course with This Method? Can You Explain with the Reason?"

	Codes	**Participants**	**N**
Advantage	Enjoyable/Fun	S1,S2,S3,S5,S6,S7,S10,S11,S12,S13,S15,S16,S17 S18, S19, S21, S22, S23, S24, S25	20
	Persistence	S1, S3, S5, S6, S7, S8, S9, S10, S12, S13, S14, S15, S16, S20, S21, S22, S23, S25	18
	Active participation	S1, S5, S11, S17	4
	Motivation	S3, S6, S19,	3
	Visualization	S2, S3	2
	No need for memorization	S8, S13	2
	Remarkable	S18, S24	2
	Theater talent	S7, S9	2
	Success	S6	1
	Self-confidence	S2	1
	Understandability	S24	1
	Time	S4, S19, S20	3
Disadvantage	Lack of materials	S19	1

Examples of statements of the students who expressed an opinion on this subject are given below.

> *"The advantage is that the lesson is more enjoyable and fun, you both learn and do not get bored, our active participation in the lesson has increased and at the same time it is more memorable, I liked it very much." (S1)*
> *"It is fun and more fluent. It is more understandable for me and I think it becomes more remarkable." (S24)*
> *"I think the disadvantage is that it is time consuming." (S4)*
> *"Disadvantage: It can be in terms of lack of time and material." (S19)*

Table 3 contains the coded thoughts of the students regarding the responsibilities and duties involved in the processing of the lesson by this method. In this context, examples of students' opinions are provided below.

> *"We are assigned the responsibility of homework in order to present well in class, as we need to work on our roles at home."(S4)*

"I needed to research the topic in advance in order to prepare appropriately for my task, in this way I embraced my duty, and I also needed to listen to the lesson attentively." (S2)

"I need to listen to the lesson better and concentrate more." (S12)

"I realized that my role will not be taken lightly while preparing seriously." (S10)

Table 3. Students' Opinions on the Question "What Are Your Thoughts about the Duties and Responsibilities of Teaching the Course with This Method?"

Codes	**Participants**	**N**
Homework	S4, S19, S20, S12, S14	5
Seriousness	S9, S10, S11, S21, S22	5
Concentration/Attention	S5, S2, S7, S8, S6, S12, S15, S17, S18, S23, S24, S25	11
Research	S1, S2, S3, S13, S16	5

In Table 4, codes containing the opinions of students on which subjects the technology-supported drama method should be used have been identified.

Table 4. Opinions of Students Regarding the Question "In Which Other Courses Do You Think Technology-Supported Drama Method Should Be Used?"

Codes	**Participants**	**N**
First Aid	S1, S2, S3, S4, S6, S7, S8, S11, S12, S14, S15 ,S16, S17, S19, S21, S22, S24, S25	18
Anatomy	S5, S8, S9, S10, S13, S15, S16, S23, S24	9
Physiology	S3, S18, S20	3
Medical Terminology	S8, S14, S16	3
Special Education	S10, S12	2
History	S9	1

In this context, examples of students' expressions are given below.

"Anatomy, first aid, and medical terminology courses should also use technology-supported drama method just like in this course."(S8)

"Teaching anatomy in this way makes it more enjoyable and lasting."(S5)

"First aid course should definitely be taught in a practical way. When the course is taught in a normal manner, we don't retain anything in our minds, so the lessons are unproductive, even though it is a very important course and should be taught practically." (S22)

The codes containing the opinions of students regarding additions and suggestions are defined in Table 5. In this context, examples of students' expressions are presented below.

"More tools and equipment can be used."(S19)

"I request that such types of activities and methods continuously motivate and attract the student's interest, and that there is a demand for them to be ongoing and increasing."(S1)
"I wish some of my friends whom I wanted to add would work harder and perform their roles better." (S8)
"I want the lessons to be taught like this continuously because it's more enjoyable." (S2)

Table 5. Students' Opinions Regarding the Question "Please Specify What You Would Like to Add and Your Suggestions?"

Codes	**Participants**	**N**
Tools and equipment	S19, S4, S3	3
Continuity	S1, S2, S9, S5, S6, S7, S10, S11, S12, S13, S5, S20, S21, S22, S23, S24	16
Role study	S8, S18,	2
Thanks	S4, S14, S16, S17, S25	5

Discussion and Conclusion

This research aims to evaluate the effectiveness of new teaching methods in biology classes by investigating the effects of technology-supported drama activities for teaching the central nervous system on students' perspectives. Evaluating the impact of technology-supported drama activities on students learning the central nervous system is important in terms of using different and innovative methods in education.

In our study, students expressed that they had fun and found the information more lasting through the technology-supported drama activity. These findings are consistent with the literature. The study conducted by Türkel (2013) states that creative drama activities lead to the development of interest, desire, and appreciation for writing by students. A study investigating the impact of creative drama activities on the success level in a social studies class found that students in the experimental group found the lessons more enjoyable and fun. The same study observed an increase in class participation (Nayci &Adıgüzel, 2017). A study where the creative drama method was applied in the social studies class found that students had a positive view of this method and expressed a better understanding of topics (Yalçınkaya, 2010). As in our research, many studies conducted on this subject have observed that creative drama makes lessons more enjoyable, facilitates learning, and increases motivation and success levels (Alrutz, 2004; Teker, 2009; Yılmaz, 2006).

The education literature presents studies showing that when the technology-assisted training technique is used in the courses, students find the lessons more enjoyable and express views that knowledge is obtained permanently and easily (Akgün et al., 2014; Karadüz & Baytak, 2013). In a study conducted by Öztürk and Korkmaz (2020), an unstructured interview method was used to determine students' thoughts on technology-assisted creative drama activities. In the study, students stated that technology-assisted creative drama activities were not used in lessons, but that they found such activities pleasant and enjoyable, contributing to permanent knowledge and strengthening social relationships. A study conducted by Dimililer et al. (2017), used a semi-structured interview method with a technology-based creative drama technique to highlight the importance of alternative, innovative, and effective

teaching practices in English courses. The study indicates that students improve speech and writing with this technique and develop emotional and social intelligence, but that these activities take time. Our research also shows that some students have the opinion that these activities take time.

The thoughts of students about the tasks and responsibilities imposed in processing the course with technology-assisted drama method indicate that the greatest effect is on concentration. Since the method encourages active participation, students may focus with greater concentration while studying. As Sağlam (2003) says, the development of attention and concentration can occur through many social activities. Thanks to the gamification of education, students unconsciously perform many mental activities in a playful way, especially in collective training; this contributes to the development of attention.

According to students' opinions, the technology-supported drama method should be used in first aid courses because this method allows the development of practical skills for emergency situations and the reenactment of real-life scenarios. A study conducted by Büyükbörklü et al. (2010) found that computer-assisted first aid teaching provided permanent learning to students and increased students' interest in the course. Sancar et al. (2009), concluded that first aid training given with the creative drama method is more effective than standard courses.

Recommendations

Our study shows that students' technology-supported drama activities increase students' interest in the course. Since technology-supported creative drama activities provide students with a learning environment that they enjoy, this method can be recommended to increase students' interest in lessons and ensure permanent learning of content. The suitability of this method for teaching other subjects within the scope of the biology course and, in fact, for teaching subjects from other courses, should be investigated. The study can be approached from different perspectives by extending the experimental period and diversifying the technological tools.

References

Akgün, A., Özden, M., Çinici, A., Aslan, A., & Berber, S. (2014). An investigation of the effect of technology-based education on scientific process skills and academic achievement. *Electronic Journal of Social Sciences, 13*(48), 27-46.

Alrutz, M. (2004). *Energy Matters: An investigation of drama pedagogy in the science classroom* (Publication No. 3123511) [Doctoral dissertation, Arizona State University]. ProQuest Dissertations Publishing.

Annarella, L. A. (1992). *Creative drama in the classroom*. (ERIC Document Reproduction Service No. ED391206)

Aydın, S., & Bülbül, M. Ş. (2011). Using drama for learning biology subjects: teaching applications as an example. *Bayburt Education Journal, 6*(1), 86-94.

Aytaçlı, B. (2012). A detailed analysis on case study. *Adnan Menderes University Faculty of Education Journal of Education Sciences, 3(1), 1-9.*

Baş, M. B., & Karamustafaoğlu, O. (2020). An educational game on central and peripheral nervous system. *Gazi*

Journal of Education Sciences, *6*(1), 80-92.

Büyükbörklü, A., Bakırcı, H., & Boynukara, Z. (2010). Effects of computer aided health and first aid instruction on student success. *Erzincan Üniversitesi Eğitim Fakültesi Dergisi, 12*(1), 251-264.

Büyüköztürk, Ş., Kılıç Çakmak, E., Akgün, Ö. E., Karadeniz, Ş., & Demirel, F. (2012). *Örnekleme yöntemleri.* Access address: http://w3.balikesir.edu.tr/~msackes/wp/wpcontent/uploads/2012/03/BAY-Final-Konulari.pdf

Coştu, B., Ayas, A., & Ünal, S. (2007). Misconceptions about boiling and their possible reasons. *Kastamonu Education Journal, 15*(1), 123-136.

Çam, F. (2008). *Biyoloji derslerinde yaşam temelli öğrenme yaklaşımın etkileri*. [Master thesis]. Atatürk University, Erzurum, Türkiye.

Dimililer, Ç., Kurt, M., Kaşot, N., & Sözüdoğru, O. (2017). Technology and drama based creative collaborative writing in teaching. *Eurasia Journal of Mathematics, Science and Technology Education*, *13*(8), 5095-5106. https://doi.org/10.12973/eurasia.2017.00952a

Genc, S. Z., & Eryaman, M. Y. (2008). Changing values and new education paradigm. *Journal of Social Sciences of the Afyon Kocatepe University*, *9*(1), 89-102.

Gerring, J. (2004). What is a case study and what is it good for? *American political science review, 98*(2), 341-354. https://doi.org/10.1017/S0003055404001182

Güneş, M. H., & Güneş, T. (2005). Difficulties and their reasons in learning biology concepts in primary school students. *Gazi University Kırsehir Faculty of Education, 6*(2), 169-175

Harwood, T. G., & Garry, T. (2003). An overview of content analysis. *The marketing review, 3*(4), 479-498. https://doi.org/10.1362/146934703771910080

Heale, R., & Twycross, A. (2018). What is a case study? *EvidenceBased Nursing, 21*(1), 7-8. https://doi.org/10.1136/eb-2017-102845

İşman A., (2005). *Öğretim teknolojileri ve materyal geliştirme*. Pegem-A Press First Edition, Ankara, Türkiye.

Karaduman, B., & Emrahoğlu, N. (2011). Maddenin tanecikli yapisi" ünitesinin öğretiminde, bilgisayar destekli ve bilgisayar temelli öğretim yöntemlerinin, akademik başari ve kaliciliğa etkisi. *Kastamonu Eğitim Dergisi*, *19*(3), 925-938.

Karadüz, A., & Baytak, A. (2013). An analysis of perceptions of the students in the Turkish education program about technology supported instruction. *Sakarya University Faculty of Education Journal,* (20), 7-29.

Kolovou, M., & Nam Ju Kim (2020) Effects of implementing an integrative drama-inquiry learning model in a science classroom. *The Journal of Educational Research, 113*(3), 191-203. https://doi.org/10.1080/00220671.2020.1771673

Korkmaz, Ö., & Buyruk, B. (2016). Students' correlation status of concepts of science and technology course in their daily lives. O*ndokuz Mayis University Journal of Education Faculty, 35*(1), 159-172.

Nayci, Ö., & Adıgüzel, Ö. (2017). The effect of using creative drama as a method in social sciences lesson to student success. *Education and Science, 42*(192), 349-365.

Nwagbo, C. (2006). Effects of two teaching methods on the achievement in and attitude to biology of students of different levels of scientific literacy. *International Journal of Educational Research, 45*(3), 216-229. https://doi.org/10.1016/j.ijer.2006.11.004

Öztürk, Ç., & Korkmaz, Ö. (2020). Teknoloji destekli yaratıcı drama etkinliklerinin öğrencilerin sosyal bilgiler

dersine dönük tutumlarına ve problem çözme becerilerine etkisi. *Yaratıcı Drama Dergisi*, *15*(1), 1-18.

Pathak, V., Jena, B., & Kalra, S. (2013). Qualitative research. *Perspectives in clinical research, 4*(3),192. https://doi.org/10.4103/2229-3485.115389

Porozovs, J., Liepniece, L., & Voita, D. (2015). Evaluation of the teaching methods used in secondary school biology lessons. *Signum Temporis, 7*(1), 60. https://doi.org/10.1515/sigtem-2016-0009

Prasad, B. D. (2008). Content analysis. *Research methods for social work*, 5, 1-20.

Sağlam, T. (2003). Dramatic education: Aim or medium? *Tiyatro Araştırmaları Dergisi,*17(17),4-21. https://doi.org/10.1501/0000059

Saka, A., Ebenezer, J., Çakır, I., & Saka, A. (2016). Pedagogy of creative drama in biology. *Open Journal of Social Sciences,* 4, 187-198. https://doi.org/10.4236/jss.2016.43024

San, İ. (2006). *Yaratıcı dramanın eğitsel boyutları*, Adıgüzel, H. Ö (Ed.), Yaratıcı Drama 1985-1998 Yazılar, (Expanded Second Edition). Naturel Kitap Press.

Sancar, B., Açıkgöz, İ., & Yalçın, A. S. (2009). İlk yardım eğitiminde yaratıcı drama yönteminin başarı üzerine etkisi. *Yaratıcı Drama Dergisi, 4*(8), 81-98. https://doi.org/10.21612/yader.2009.014

Selvi, K. (2013). Yaratıcı drama yönteminin eğitimde kullanılması. *Marmara Üniversitesi Atatürk Eğitim Fakültesi Eğitim Bilimleri Dergisi, 11*(11), 301-308.

Sevimli, E., & Delice, A. (2015). Can technology-assisted instruction improve theoretical awareness? The case of fundamental theorem of calculus. *Turkish Journal of Computer and Mathematics Education (TURCOMAT), 6*(1), 68-92. https://doi.org/10.16949/turcomat.44905

Shim, K. C., Park, J. S., Kim, H. S., Kim, J. H., Park, Y. C., & Ryu, H. I. (2003). Application of virtual reality technology in biology education. *Journal of Biological education, 37*(2), 71-74. https://doi.org/10.1080/00219266.2003.9655854

Teker, E. (2009). Fen ve teknoloji öğretiminde yaratıcı drama yönteminin kullanılmasının ilköğretim öğrencilerinin fenne yönelik görüşlerine ve çevre ile ilgili problem durumlara etkisi (Master's thesis, Abant İzzet Baysal University, Bolu, Turkey). Retrieved from https://tez.yok. gov.tr/UlusalTezMerkezi/

Tsaushu, M., Tal, T., Sagy, O., Kali, Y., Gepstein, S., & Zilberstein, D. (2012). Peer learning and support of technology in an undergraduate biology course to enhance deep learning. *CBE—Life Sciences Education, 11*(4), 402-412. https://doi.org/10.1187/cbe.12-04-0042

Türkel, A. (2013). The effect of creative drama on students' creative writing success and writing attitude (Sample eighth class students). *Buca Eğitim Fakültesi Dergisi*, 36:1-11.

Yalçınkaya, E. (2010). Students' opinions related to the drama method used in social studies lesson. *Milli Eğitim,,* 186, 278-290.

Yaman, H., & Erdoğan, Y. (2007). İnternet kullanımının Türkçeye etkileri: Nitel bir araştırma. *Journal of Language and Linguistic Studies*, *3*(2), 237-249.

Yang, K. T., Wang, T. H., & Chiu, C. M. H. (2015). Study the effectiveness of technology-enhanced interactive teaching environment on student learning of junior high school biology. *Eurasia Journal of Mathematics, Science and Technology Education, 11*(2), 263-275. https://doi.org/10.12973/eurasia.2015.1327a

Yenilmez, K., & Uygan, C. (2010). The effects of creative drama method on 7th grade students' self-efficacy beliefs on geometry. *Kastamonu Education Journal, 18*(3), 931-942.

Yıldırım, A., & Şimşek, H. (2005). *Sosyal Bilimlerde Nitel Araştırma Yöntemleri*. Ankara: Seçkin Press.

Yıldırım, A., & Şimşek, H. (2006). *Sosyal bilimlerde nitel araştırma yöntemleri* (5. Baskı). Ankara: Seçkin Yayıncılık.

Yıldırım, S., Yıldırım, G., Çelik, E., & Aydın, M. (2014). Student opinions about infographics design process. *Journal of Research in Education and Teaching, 3*(24), 247-255.

Yılmaz, G. (2006). *Fen bilgisi öğretiminde drama yönteminin kullanımı*. (Master's thesis, Pamukkale University, Denizli, Türkiye). Retrieved from https://tez.yok. gov.tr/UlusalTezMerkezi/

Yin, R. (1984). *Case study research: design and methods.* (3. Basım). California: Sage Publications.

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