



# An Instructional Design for Teaching Particulate Nature of Matter to Visually Impaired Students



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## Introduction

Science typically provides students with a variety of opportunities to explore and examine real materials or models closely even if they are visual impaired. Science naturally provides visual impaired with the opportunities to develop their tactual exploration and fine motor skills through the exploration and manipulation of real materials. But traditionally science teaching mostly depend on visual instruction. This makes science learning difficult for visually impaired students. On the other hand, blind students have no visual input at all. So, some arrangements and accomodation should be done at teaching due to visual impairment.

## Method

Design based research (DBR) method was used in this study. DBR approach has been suggested as a solution for the connections between educational research and praxis. The research was carried out in three steps:

### First Step

Visually impaired students’ individual needs have been identified in terms of sci-entific process skills and conceptual understanding regarding “The particulate nature of matter” unit. At this step, the embedded single-case design was used.

### Second Step

Instructional materials and activities were designed.

### Last Step

Instructional materials and activities were designed. In the last step, the instruc-tional materials that are designed for teaching particulate nature of matter to visually impaired students were evaluated in term of practicality, applicability and shortcomings. At this stage, the embedded single-case design was used.

## The Participants

Participant of this activity was eight students.

Student No	Vision Level
Ö1	Low Vision
Ö2	Blind
Ö3	Low Vision
Ö4	Blind
Ö5	Blind
Ö6	Low Vision
Ö7	Low Vision
Ö8	Low Vision

Study group for the last stage

## Data Collection Tools

Academic achievement test and semi-structured interview form were used as a data collection tools to determine effectiveness of instructional design.

Achievement Test: Test was developed in order to measure students’ achievement before and after teaching.

Semi-structured interview form : Form is used for the purpose of determining the conceptual learning levels of the students.

## Findings

In this section, the findings obtained as a result of the analysis of study data are presented in titles first stage, second stage and last stage.

### First Step

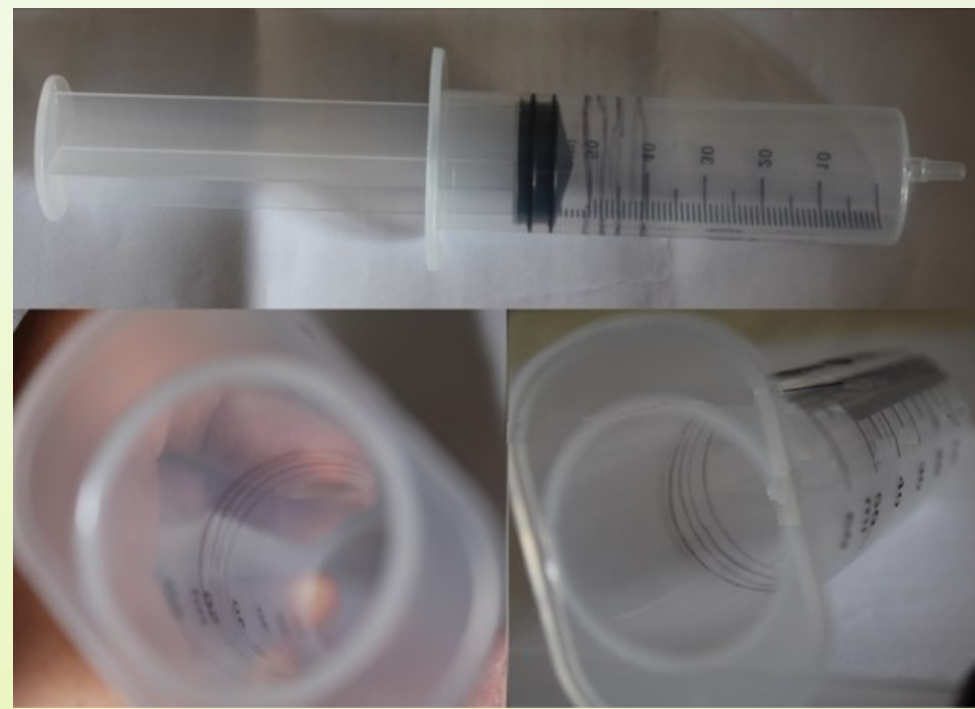
According a result of interviews and observation analyses. it was identified that no activities towards stu-dent's use of any tools or materials during the lessons. This case creates an obstacle to structuring of knowledge especially for visually impairment students. It was decided that using tools and materials at

### Second Step

Activity and matarial were designed based on the information obtained from the students.

Activity: Activity is designed appropriately to 5E. 5E learning activity was developed by the researchers based on the “Particulate Nature of Matter” unit’s objectives.

Matarial: The activity of “Particulate Nature of Matter” was planned for the purpose of bringing “to comp-rehend that particulate, blanked and moving natüre of matters.” learning outcomes to visually impaired students.



Material has been found useful by experts. But visually impairment students who have’t understood stucking material. Because visually impairment students says: “material is not audible”, “Does moving the handle?” and “I don’t know push”



Material has been found useful by experts. Students didn’t useful. Be-cause visually impairment students says: “I hear less sound of ‘tık, tık”and “screw was skined”



Material has been found useful by experts and students. Students says: “Yes, I hear sound of ‘tık, tık’. But friend with hearing impair-ment can’t hear.”. But during trails, students were damage parts.. Therefore material has been found useful by researchers.

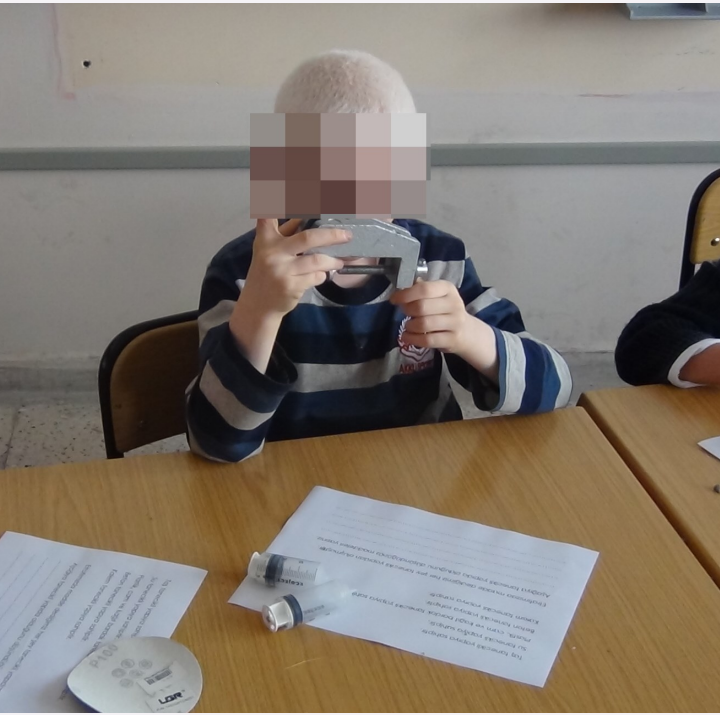


### Last Material

Material has been found useful by experts and students. Students says: “If coins in the syringe, don’t compress the syringe,. But I comp-press the syringe , if air in the syringe. I understand particulate and blanked nature of matters”, “This material is best in the designs.”, “I can feel comperssing. It very nice materials.”, “If I compress, matter is

## Conclusion

### Last Step



Teacher: “What is in the syringe?”

Ö3: “Solid”

Teacher: “Can you compress?”

Ö3: “I can try. Oooo I can not compress. It is solid.”

Teacher: “why is solid?”

Ö3: “because particulates are very close.”

Students' success was observed as 78% when interviews and tests were analysed compared with the analysis that have done before starting implementation of instructional design. Nearly all of the students said they were quite sat-isfied with model and will be satisfied if all courses would be taught with this model. According to this, the result of learnings happening in the environments where the students are made to participate actively in the lessons being more effective. The activity used in the study is an activity used for normal students and arrangements and adaptati-ons were made by taking learning needs of low vision or blind students into consideration. Thus, student could use learning tools and could actively participate to class.

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