
The Eurasia Proceedings of Educational & Social Sciences (EPESS), 2014

Volume 1, Pages 386-390

ICEMST 2014: International Conference on Education in Mathematics, Science & Technology

EXAMINING THE CONCEPT CARTOONS BY PRE-SERVICE PRIMARY SCHOOL TEACHERS

Şule BAYRAKTAR
Necmettin Erbakan University

ABSTRACT: In this study, examples of concept cartoons created by pre-service primary teachers related to certain science topics were presented. The concept cartoons created by student-teachers were examined in terms of topics they were related to, type of the characters, forms of expressions in presenting different claims of the characters. Results of the study showed that student-teachers were well aware of the misconceptions that primary school students might have posses in various science subjects and they have gained adequate skills to create appropriate concept cartoons to diagnose these misconceptions.

Keywords: Concept cartoons, science teaching, pre-service primary teachers, misconceptions

INTRODUCTION

Concept cartoons are one of the most effective tools that can be used to detect students' misconceptions. Concept cartoons, unlike regular cartoons are not for humor purposes. Concept cartoons were created in 1992 for instructional purposes and based on the dialogs of cartoon characters (Keogh & Nylor, 1999). Generally they involve three or more characters which might be human, animal or non living things. Each one of these characters presents an idea about a scientific phenomenon. At least one of these ideas indicates a misconception, one presents the scientific idea and the ideas of other characters might be scientific or nonscientific ideas. Students are introduced with the cartoons and they are asked which character they are agree with. Students' conceptions or misconceptions can be identified by examining the ideas of the character which s/he indicated that s/he is agreed on.

Concept cartoons have a special place in especially science education since that they can relate sophisticated scientific concepts with the situations which we encounter in everyday life. They can be considered as practical visual instructional tools which are very effective in attracting students' attention and creating curiosity. Besides motivating students, concept cartoons can be used to initiate discussion during the class session, to give students feedback. They can also be used as an alternative assessment tool.

The main phases of the instruction with concept cartoons are: a) introducing the cartoon to students, b) Discussion of the ideas that the cartoon characters proposed c) Inquiry process d) re-evaluating the ideas proposed by the cartoon characters in the light of the data obtained during the inquiry process.

Students' misconceptions can be changed by means of discussion and cognitive processes which was initiated by concept cartoons (Andrews, Kalinowski, and Leonard, 2011) Concept cartoons do not tell students which idea is correct. For this reason, they can stimulate students' thought process which might lead them to question their existing ideas and as a result change the incorrect ideas and construct scientific conceptions as well as increasing their motivation for the lesson to be taught. (Keogh & Naylor, 1996; Long & Marson, 2003).

In the literature, there are many studies focusing on the effects of concept cartoons in different educational levels in Turkey (Demir, 2008 ; İnel, Balım & Evrekli, 2009; Kabapınar, 2005; Oluk & Özalp, 2007) and in the world (Keogh & Naylor, 1999; Morris, Merritt, Fairclough, Birrell, and Howitt, 2007; Chin & Teou, 2009). The cartoons found to be an effective tool in teaching of various subjects (İnel & Balım, 2013; Gölgeci & Saracoğlu, 2011; Perales-Palacios & Vilchez González, 2005) and overcoming misconceptions (Ekici, Ekici & Aydın, 2007). Concept cartoons are also practical as an alternative assessment tool (Kandil-İnceç, 2008; Naylor, Keogh, & Downing, 2007; Song, Heo, Krumeraker, & Tippins, 2008; Şaşmaz-Ören & Ormancı, 2011).

- This is an Open Access article distributed under the terms of the Creative Commons Attribution-Noncommercial 4.0 Unported License, permitting all non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

- Selection and peer-review under responsibility of the Organizing Committee of the conference

*Corresponding author: Şule BAYRAKTAR- e-mail: sulebayraktar@yahoo.com

METHOD

The purpose of this research presents a different aspect from the research done previously in this area. This research examines the concept cartoons drawn by pre-service primary teachers in some respects. The researcher is an academician who works in a teacher training institute with primary education majors. In the science methods course which she instructs, first she introduced the concept cartoons to the primary education students. The instructor then, showed sample concept cartoons to the class and allow them to examine the cartoons in detail. Then, she presented the techniques on how to use concept cartoons during the instructional process and performed a sample lesson. Primary Education majors were aware of the misconceptions that primary school children's might possess in several science subjects, since they have examined the primary school curriculum already and they have identified the most common misconceptions of children of these grades. Afterwards, pre-service primary teachers were asked to prepare concept cartoons which were related to one subject of their preference which takes place in the primary school science curriculum. They were given time as much as they desire, the completed concept cartoons gathered together and examined regarding different aspects of them. The sample of this study consisted of 49 concept cartoons. Concept cartoons drawn by pre-service primary teachers were analyzed by using categorical content analysis. This technique of content analysis is not restricted to textual analysis, but may be applied to other areas such as coding student drawings (Stemler, 2013). Concept cartoons were examined in terms of: a) the subjects they were related to b) type and the number of the characters c) forms of expression they used to present the misconceptions. The results obtained by examination of the cartoons according to the designated categories are presented in the following section.

RESULTS

A. Examination of Cartoons by Subjects

Table1. Cartoons by Subject

Teaching Unit (Subject)	f (%)
Living Things	20(40.8)
Matter and Change	10(20.4)
Earth, Sun & Moon	9(18.36)
Light & Sound	3(6.12)
Electricity	4(8.16)
Others	3(6.12)
Total	49(100)

Most of the student teachers' concept cartoons (40.8%) were related to living things teaching unit. Second popular subject was Matter and Change teaching unit (20.4%) followed by Earth and the Space(18.6%). There were fewer cartoons related to other subjects in science curriculum. It was especially noteworthy that there was only one cartoon related to force and movement unit.

B. Examination of Cartoons by Character Type

Table 2. Cartoons by Character Type

Character Type	f (%)
Human	29(59.18)
Animal	9(18.36)
Nonliving things	6(12.24)
Combination	5(10.20)
Total	48(100)

When the characters examined, it is seen that student teachers mostly chose to draw human characters and most of them had 3 characters (n= 24) and others 4 or more (n=5). Some drawings contained animal characters (n=9). Examining the drawings it was seen that those drawings with animal characters were related to the topic of

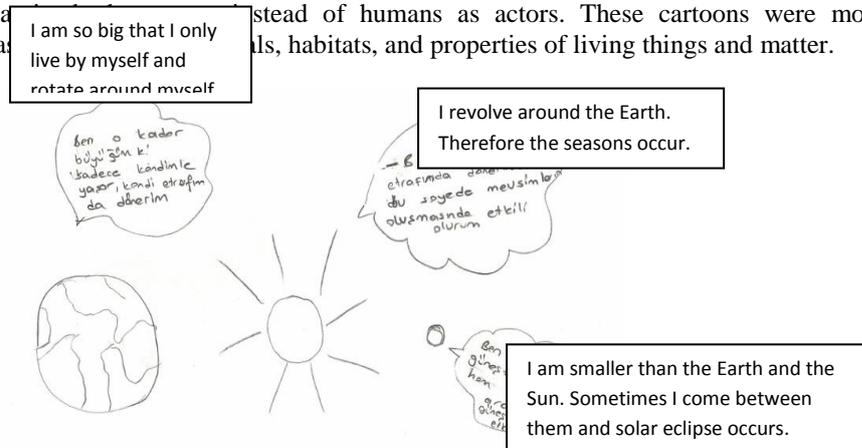
habitats and classification of animals. The other characters such as plants and nonliving things were chosen concordant with the topic of misconceptions.

C. Examination of Cartoons by Form of Expression

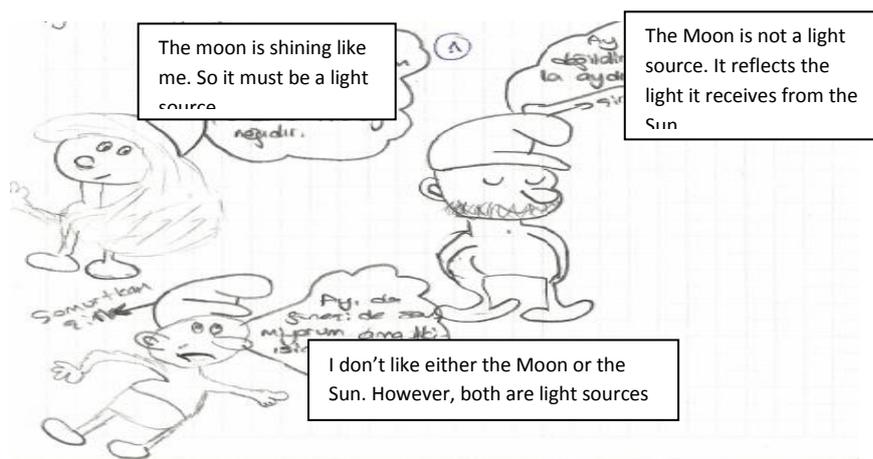
Table 3. Cartoons by Form of Expression

Form of Expression	f (%)
Personification	17(34.69)
Dialog (Direct expression)	13 (26.53)
Express in a Story -or using real life examples	19(38.77)
Total	49(100)

1. Personification: In 17 of the 49 cartoons animals, plants and nonliving things (earth, sun, moon, cars, other objects) were made to talk. In these cartoons the student teachers preferred to use the specific objects of the example instead of humans as actors. These cartoons were mostly about Earth and Space, planets, habitats, and properties of living things and matter.



2. Dialog (Direct Expression): Direct expression or dialog of people were chosen as a form of expression for presenting misconceptions which were related to the following topics: evaporation of liquids (n=2), electricity (n=2), shape of the Earth (n=1) Respiration of plants (n=1) Matter (n=2), Movements of the Sun, Earth and Moon (n=3) Classification of animals (n=2).



3. Generating a story or relating the real life examples. Student teachers used stories or real life examples especially for the topics of matter and change teaching unit such as: evaporation (n=1), mass conservation (n=2) Impurities-boiling point (n=1) granular solids (n=1) properties of living things (n=1), Elevation-temperature relation (n=1).



DISCUSSION

The examination of the concept cartoons created by student-teachers revealed that they were aware most of the misconceptions that their future students might have possess. Student teachers created fewer concept cartoons for some teaching units especially “force and movement” and “light and sound”. The reason for that might be there were fewer misconceptions reported in the literature on these specific topics and the content of them were relatively less than the other topics in primary science curriculum in Turkey. However, it is also possible that student teachers might not aware of the misconceptions peculiar to those topics. However, since student teachers decided themselves on the topics of the cartoons they draw, it is not possible to know the reason for their not drawing cartoons about some particular topics. They might also have difficulties about how to express the misconceptions about certain topics, so they did not chose to draw cartoons about those topics. An interview with the student teachers might have shed light on this issue.

Results of this study also showed that student teachers were well aware of the function and elements of a concept cartoon. Except for three of them, all the concept cartoons possess all the qualities that a concept cartoon must have. Furthermore, student teachers were successful in using appropriate expression forms for their cartoons which is compatible wit the subject they chose. They insert their cartoons in a story or present real life examples to make abstract concepts more concrete. It is also remarkable that student teachers added various contents in the background of their drawings which are highly related to the subject, such as a container filled with water on fire in the cartoon about boiling point; and the natural environment around the animals in the cartoon about the habitats.

CONCLUSION

A comparison with earlier studies cannot be made for this study since it is one of the firsts. However, the result of the study is significant. Student teachers’ concept cartoons showed that they were aware of the misconceptions in various topics of the science curriculum and that they gained the skills to create a concept cartoon which is one of the most effective tools for diagnosing students’ misconceptions. To create concept cartoons correctly, student-teachers should be knowledgeable about the misconceptions of students as well as the elements and the properties of a concept cartoon itself. Student teachers’ creating their own concept cartoons could be a beneficial practice in science methods courses.

REFERENCES

- Andrews, T.M., Kalinowski, S. T. & Leonard, M. J.(2011). Are humans evolving? A classroom discussion to change student misconceptions regarding natural selection. *Evolution: Education and Outreach* 4, 3, 456-466.
- Chin, C. & Teou, L.(2009) Using concept cartoons in formative assessment: Scaffolding students’ argumentation. *International Journal of Science Education*, 31,10, 1307-1332.
- Demir, Y.(2008). Kavram yanlışlarının belirlenmesinde kavram karikatürlerinin kullanılması. Yüksek Lisans Tezi, Fen Bilimleri Enstitüsü, Atatürk Üniversitesi, Erzurum.

- Ekici, F., Ekici, E., & Aydın, F.(2007). Utility of concept cartoons in diagnosing and overcoming misconceptions related to photosynthesis. *International Journal of Environmental and Science Education*, 2, 4, 111-124.
- Gölgeli, D. & Saracoglu, S.(2011). Fen ve Teknoloji Dersi Işık ve Ses ünitesinin öğretiminde kavram karikatürlerinin kullanımının öğrencilerin akademik başarısına etkisi, *Erciyes Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, 31, 113-124.
- İnel, D., Balım, A.G. & Evrekli, E.(2009). Fen öğretiminde kavram karikatürü kullanımına ilişkin öğrenci görüşleri.. *Necatibey Eğitim Fakültesi Elektronik Fen ve Matematik Eğitimi Dergisi* 3,1, 1-16.
- İnel, D. & Balım, A. G. (2013). Concept cartoons assisted Problem Based Learning Method in Science and Technology teaching and students' views. *Procedia-Social and Behavioral Sciences*, 93, 376-380.
- Kabapınar, F. (2005). Yapılandırmacı öğrenme sürecine katkıları açısından fen derslerinde kullanılabilecek bir öğretim yöntemi olarak kavram karikatürleri. *Kuram ve Uygulamada Eğitim Bilimleri*, 51, 101-146.
- Kandil-Ingec, S.(2008). Use of concept cartoons as an assessment tool in physics education. *US- China Education Review*, 5, 11.
- Keogh, B. & Naylor, S.(1996). Teaching and learning in science: A new perspective. *Lancaster: British Educational Research Association Conference*.
- Keogh, B. & Naylor, S.(1999). Concept cartoons, teaching and learning in science: an evaluation, "*International Journal of Science Education*, 21(4), 431-446.
- Larkin, D.(2012). Misconceptions about "misconception: Pre-service secondary science teachers' views on the value and role of student ideas. *Science Education*, 96, 5, 927-959.
- Long, S. & Marson, K.(2003). Concept cartoons. *Hands on Science*, 19, 3, 22-23.
- Morris, M., Merritt, M., Fairclough, S., Birrell, N. & Howitt, C.(2007). Trialing concept cartoons in early childhood teaching and learning of science. *Teaching Science*, 53(2), 42-45.
- Naylor, S., Keogh, B. & Downing, B.(2007). Argumentation and primary science. *Research in Science Education*, 37, 1, 17-39.
- Oluk, S. & Ozalp, I.(2007). The Teaching of Global Environmental Problems According to the Constructivist Approach: As a Focal Point of the Problem and the Availability of Concept Cartoons. *Educational Sciences: Theory and Practice* 7, 2, 881-896.
- Öztuna-Kaplan, A. & Boyacioglu, N.(2013). Granular structure of the substance in the children's cartoons. *Journal of Turkish Science Education*, 10, 1, 156-175.
- Perales-Palacios, F. J. & Vílchez-González, J. M. (2005). The teaching of physics and cartoons: Can they be interrelated in secondary education? *International Journal of Science Education*, 27, 14, 1647-1670.
- Sasmaz-Oren, F. and Ormanci, U. (2011). Teacher candidate levels of familiarity with the methods, techniques and tools composing the alternative assessment approaches. *Procedia-Social and Behavioral Sciences* 15, 3476-3483.
- Song, Y., Heo, M., Krumenaker, L. & Tippins, D.(2008). Cartoons: An Alternative learning assessment. *Science Scope*, 31,5, 16-21.
- Stemler, S.(2013). An overview of content analysis. *Practical Assessment Research & Evaluation*, 7(17). Retrieved December 9, 2013 from <http://PAREonline.net/getvn.asp?v=7&n=17>