Education Activities of Astronomy in Japan

Masafumi Matsumura
Faculty of Education, Kagawa University, Takamatsu, Kagawa,760-8522, Japan

ABSTRACT
I report the recent education activities of astronomy in Japan. The contents of astronomy taught in schools will increase in a few years, according to the new version of curriculum guidelines released by the government in March 2008. Explanatory meetings for senior high school students were held for the first time in June 2008, in which astronomy in universities is introduced to senior high school students who are interested in astronomy. There are many activities of astronomy education not only in schools and universities, but also in facilities of social education and other places. I introduce one of those activities, the certificate of astronomy guide system.

Key words: Astronomy Education, Astronomy Popularization

1 INTRODUCTION
Although many activities are present in astronomy education in Japan, a few review papers about them are found in astronomical literature written in English. Owaki and Isobe (1988) investigated the difficulties that teachers had in teaching astronomy in classes, and reported the Japanese astronomical education in the late 1980’s. Isobe (1991) showed different categories of people with various degrees of interest in astronomy, and discussed roles of schools and planetariums. He pointed out the important role of schools to reduce the number of people who are not interested in astronomy. A more recent review was given by the present author (Matsumura 2008).

More papers on astronomical education and/or popularization appear in books or in journals written in Japanese. Kuroda et al. (2008) has recently presented a historical review of Japanese astronomical education and popularization. The journal "Astronomical Herald" published by the Astronomical Society of Japan occasionally carries papers on astronomy education. The "Tenmon-Kyoiku" (meaning "astronomical education" in Japanese) is published bimonthly by the "Japanese Society for Education and Popularization of Astronomy" (hereafter JSEPA, see Appendix), and it carries articles about astronomy education and popularization more often.

Much variation has not been observed since the recent review by myself (Matsumura 2008), except for the activities on the International Year of Astronomy 2009 (IYA2009), which are discussed elsewhere in these proceedings. Nevertheless, there are still a few topics about astronomy education. One of the topics is the revision of the curriculum guidelines (hereafter CGs) by the Ministry of Education, Culture, Sports, Science and technology (hereafter MEXT), a branch of the government. The CGs specify the contents of school education. Section 2 discuss the revision of CGs. For senior high school students, explanatory meetings were held in 2008 where astronomy courses, and some related courses, in universities are introduced to students (Section 3). Another new activity is the certificate of astronomy guide system originally developed by S. Shibata (Section 4). In Appendix, the details of Japanese Society for Education and Popularization of Astronomy (JSEPA) are presented. Although this paper is far from a complete review of astronomy education in Japan, there are some important contributions in these proceedings. I suggest the reader to refer to them.

2 ASTRONOMY IN ELEMENTARY AND JUNIOR HIGH SCHOOLS AND THE CURRICULUM GUIDELINES
In Japanese school education, the curriculum guidelines (CGs) defined by MEXT specify the contents taught in classes. Following the CGs, textbooks that are used in classes are edited and published. CGs were revised about once in 10 years. The CGs for elementary and junior high schools are released in 1958, 1968, 1977, 1989, 1998, and 2008, and the CGs for senior high schools appear a few years later than those for elementary and junior high.

In March 2008, the latest version of CGs for elementary and junior high schools was released. Comparing the CGs released in 1998 (Table 1) and those in 2008 (Tables 2), we can find difference and study the variation of astronomy education.

2.1 Curriculum Guidelines Revised in 1998
According to the CGs in 1998, in the 3rd grade of elementary school, at age 9, children learn about shadow and movement of Sun. In the 4th grade, they learn movement of the moon,
and also stars. Unfortunately, from the 5th grade in elementary to the 2nd in junior high, no astronomy is taught at all in classes, this blank period is sometimes called as the "Missing 4 years". In the revision of 1998, all the contents in classes have been reduced, and astronomy was not an exception.

Agata et al. (2004) surveyed the concept of the universe of children, and they found that children of 40% in elementary school believe that the Sun revolves around the Earth. This very shocking result is probably related to the CGs in 1998.

In the 3rd grade in junior high school, children learn apparent motion of objects in sky, and the objects in the solar system. However, our galaxy and galaxies are out of the contents specified by CGs 1998.

### 2.2 Curriculum Guidelines Revised in 2008

In the revised CGs in 2008, the fundamental structure of astronomy education does not change, but the contents have increased. Table 2 shows new items with underlines.

It is remarkable that the children in the 6th grade in elementary learn astronomy, and that the 'missing 4 years' disappear. However, children in the 5th grade in elementary, and those in the 1st and the 2nd grades in junior high still do not learn astronomy.

In junior high school, the item of "our galaxy" is newly added. According to this, children's scope of view about the universe will increase. However, the CGs still lacks external galaxies and cosmology, which are important to have a macroscopic view.

### 3 SENIOR HIGH SCHOOL AND EXPLANATORY MEETING

#### 3.1 Senior High School

In senior high school, science classes are divided into four subjects, i.e. physics, chemistry, biology, and earth sciences, and astronomy. The last subject contains astronomy, geophysics, geology, etc., and covers almost all the contents concerning astronomy. A problem of the subject "earth sciences and astronomy" is the fact that the ratio of students who take this subject is very low, and is about 10%. The reason of this is not clear, however, it may be due to the fact that the "earth sciences and astronomy" is based on many academic disciplines. Although the number of teachers for the earth sciences and astronomy is not large, very active groups such as the Astro-HS (Shinohara 2008) exist, and they activate astronomy education in senior high schools.

#### 3.2 Explanatory Meeting

In spite of the fact that not so many students learn astronomy in senior high schools, astronomy and related subjects are very popular in universities. Much more astronomers are present than before and the number of astronomy groups is increasing in universities. Unfortunately, high school students do not know this fact, and they do not have much information about the education and research activities of astronomy in universities. Therefore, a meeting of astronomers and high school students who are interested in astronomy was held in Okayama University on June 22, 2008, for the first time. This meeting was organized by K. Hata and O. Ohshima, who are high school teachers. The meetings was quite successful. About 40 students and 20 others attend it, and they had a chance to talk with about 10 university astronomers. In the next year, some of those students will come to each university. There is a report that a similar meeting was held in Osaka for students in Kansai area.
4 ANOTHER NEW ACTIVITY

There is a new kind of activities related to astronomy education that are not introduced elsewhere written in English, i.e. the certificate of astronomy guide, or "sommelier of stars" system, originally developed by S. Shibata in Yamagata University in 2003 (Japanese webpage: http://astr-www.kj.yamagata-u.ac.jp/shoten/). Those who take classes and practices are certificated as an astronomy guide, or "sommelier of stars". They are experts of astronomy and sky-watching, and can tell you how to enjoy the universe, just like a real sommelier who is an expert of wine, and can show you how to taste it. Until now, about 20 persons become astronomy guides, and about 200 persons become associate guides.

The system of this certificate is new and spreading now. So it is not clear about its effect at present. However, the astronomy guides will play an important role of science communicators in near future, and will be helpful both for astronomers and citizens. Finally, it should be noted that most of the astronomy guides were not interested in astronomy before. This means that the certificate system itself popularizes astronomy.

ACKNOWLEDGMENT

I am grateful to the Chinese Astronomical Society to invite me to APRIM10 so that I had a chance to talk about Japanese astronomical education.

APPENDIX A: JAPANESE SOCIETY FOR EDUCATION AND POPULARIZATION OF ASTRONOMY

The "Japanese Society for Education and Popularization of Astronomy" (JSEPA) is a unique organization of astronomical educators and astronomers in Japan, founded in 1989. The number of members is about 650 at present. In August 2008, just after the APRIM10 meeting, its name was changed as the present one. The former name had been the "Society for Teaching and Popularization of Astronomy". Tables A1 and A2 show details of the society.

Table A1. Organization of JSEPA

<table>
<thead>
<tr>
<th>Regional Sections</th>
<th>Kyushu, Chugoku-Shikoku, Kinki, Chubu, Kanto, Tohoku, and Hokkaido</th>
</tr>
</thead>
<tbody>
<tr>
<td>Working Groups</td>
<td>Planetarium WG</td>
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<tr>
<td></td>
<td>Universal Design WG</td>
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<td>WG of Assistance for Astronomy Education in Schools</td>
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<td></td>
<td>IYA2009 Project WG</td>
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<tr>
<td>Advisory Board</td>
<td>Designated Manager’s System</td>
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<tr>
<td>Committee</td>
<td>Executive Committee</td>
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<td>Eelection Committee</td>
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<td>Editorial Committee</td>
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<td>Web Committee</td>
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</tbody>
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Table A2. Activities of JSEPA

| Annual Meeting    | summer, 1/year                                                        |
| Regional Meetings | 1 - 3 times/year in one section                                       |
| Publications      | Journal Tenmon-Kyoiku 6 issues/year                                  |
|                   | Proceedings of the Annual Meeting                                    |
|                   | Some Books                                                            |
| Activities with Astronomical Society of Japan | Support Astronomy Education Forum                                  |
|                   | Support Junior Session                                                |

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