

The Application of Instructional Media and IRS in Environmental Education - Focus on the Rocky Terrain in Northern Coast of Taiwan

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Abstract: Based on the rock and mineral in environmental education, this paper designs instructional media, with the aim to let the users realize the beautiful sceneries on the coast around Taiwan and learn about the rocky terrain at the same time. Using the IRS system, the author tries to make the computer classes for interaction between individual and personal computer, including the lecture-listen teaching model, as well as interaction between teacher and student which could provide a different teaching style. This research shows that this instructional media enables six grade students in primary school learning the relative knowledge about the rocky terrain in northern coast of Taiwan happily and effectively, while the employment of IRS could enable students concentrate more attention to their study and promote their learning interest as well.

Keywords: environmental education, instructional media, IRS, science education

1. Introduction

Taiwan is a seagirt and has graceful and magnificent coastline. These abundant marine resources are precious gifts from nature. Therefore, cultivating students with experience about the marine ecological environment around; promoting their knowledge and strengthen their awareness of protection about marine ecological environment is really significant.

In the respect of instructional media design, it mixes nature, life, science, technology and society together. Thus, students may learn the basic rocky styles, rocky characteristics, and rocky distribution in Taiwan, which could enable students further acquaint the enrichment, diversification and beauty of rocky terrain of northern coastline in Taiwan, and experience a variety of grotesque rocks shaped by various miraculous natural power. Hence, the students would concern about the changes of seashore rocks and ecological environment so as to protect and cherish the rocky mystery which was formed tens of thousands of years. According to the curriculum guidelines for science and life technology (MOE, 2008), fifth- and sixth-graders in primary schools are able to learn about the formation and characteristics of rocks. Matching the available nature and cultural characteristic in the local environment, these two kinds of learning fields integrate closely. The author hopes that through learning and understanding the different formations of seashore rocks and terrain landscape, students will arouse the concern of changes in marine geographic environment, and then show solicitude for local marine geographic ecological environment.

With the development of science and life technology, application of mobile devices in education could be seen more frequently (Ellaway, 2013). Although it brings lots of convenience for teachers and students, in the current situation of education in Taiwan, the popularizing rate of mobile devices are still lower than the computer class undoubtedly. With the updating of IRS, IRS could be operated in desktop in the way of browser. Except the flash interactive multi-media, this research relies more on the advantages of IRS and plus the section of interaction between students and teachers, not individual-machine only, to complement the function of record for students' answering condition. Thus, it makes the interaction between teachers and students more comprehensive and more appropriate for teachers to know the learning condition of students.

2. Literature Review

2.1 Theoretical Basis of Instructional Media in Aided Teaching

Instructional media has been wildly spread for its advantages, such as drive learning motivation (Liu et al, 2011) increase attention (Sun, 2014), protect and update the textbook easily, and so on. The theoretical basis of teaching by media can be divided into 2 parts:

ZPD theory, suggested by Vygotsky, states that people have 2 levels of development, one is practical development level, and the other is potential development level. Practical development level is what Piaget so-called children developmental stage, that is, possess abilities in its period; and potential development level is the ability to deal with some difficulties with the help of parents or partners. The gap between the two is called Zone of proximal development (ZPD). While students are learning something, the teachers just provide with a temporary support to give assistance to students transform from practical development level to a potential development level, which is called scaffold in deed. This scaffold is a kind of instructional strategy or teaching aid. Along with the improvement of student ability, the dominant right of learning will return to students gradually. At this time, even students don't get the help of scaffold could they get knowledge and skill successfully.

In addition, Gardner has put together multiple intelligence theories, which emphasize that everyone has entire intelligence and its exclusiveness. Gardner states that educators should do what they can to dig out the learning styles and trend of students, and then take good advantage of them to forge a most suitable education style. Multimedia integrates with film, cartoon, voice, script, pictures and some other materials and could be operated, listened and viewed for another, which enable good learning tools for different intelligent students.

2.2 Usage of IRS

IRS, Interactive Response System, is a kind of teaching application system used for feeding back information for teachers in classes through mobile devices and electrical tools. It is one of the most important information application apparatuses for improving classroom teaching quality in recent years and wildly used in classroom teaching in Europe and America. Taiwan has carried out quite a few experimental curriculums and interactive rooms in recent years. However, what is the interactive room? The so-called interactive room installs IRS acceptors in the classroom, and the teachers and students have a remote control in hands in order to continue the interactive teaching activities which but also reduces the burden on teachers (Huang et al, 2001). IRS has benefits for teachers and students both as below (Liu et al, 2006):

For students:

- (1) The motivation of active participation: provides prompt visualizing feedback for the response of questions from students, and further strengthens the motivation of active discussion.
- (2) Enables students to focus on learning content: students should choose the best answers aims to the questions which could help students thinking about the problem purposefully.
- (3) Assist students to conduct further conceptual understanding: students should tell the reason for your answer so as to promote students' thought on inner nature.

For teachers :

- (1) Assists teachers in diagnosing learning status and offers decision references: the system would help to collect the answers from students; this allows teachers to find out the learning problems of students immediately and allows teachers to make some evaluations of the condition, so that they could clear out the vague concept and enlighten subsequent discussion.
- (2) Improves the interaction between teachers and students: it allows all students to possess an equal learning chance by assisting teachers to control the equivalence while communicating.
- (3) Improves the frequency of teaching: it allows students to focus on learning points so as to save teaching time, and make class colorful and interesting but in control at the same time.

IRS has both numerous advantages, and disadvantages. For example, IRS is not the main part in class; it can't take the place of teachers. Appropriate leading and in-depth feedback from teachers will result in in-depth study (Wang et al, 2002). IRS has the feature of in-time interaction which can inspire

the interest, but may also lead to over excited students. Thus, IRS needs to be guided and managed professionally to keep a proper teaching environment.

3. Methodology

3.1 Objects of Study

This research based on purposive sampling method, and selected 118 sixth-grade students in 2 primary schools from northern Taiwan and 112 students as the valid sample size. It should be implemented in flexible classes by matching science and life technology curriculum after the normal class Rock and Mineral.

3.2 Instructional Media Design

Instructional media was made by flash and matches Nature and Life class in 6th grades; it contains: (1) various kinds of rocks with different characteristics and recognizable peculiarities. (2) changes of rocks effected by weathering, erosion and deposition. (3) present rocky terrain in coastline and flourish students to cherish and protect and appreciate geological environment in coastline. (4) describes district and regional marine rocky terrain characters. Here are the operating instructions of media as follows:

	
This is the title. Put on different buttons will help you with different learning travels.	This page is the distribution of sedimentary rocky coast in northern Taiwan, and displays different coast appearances in north and northeast with live-action.
	
This is the introduction of igneous rock with 3 buttons for different styles; pressing on the mouse will link the student to different pages where you can learn about different kinds of rocks.	This page shows the rocky terrain in northern coast of Taiwan and has marked out volcanic and sedimentary rock by animated mapping. 5 buttons for learning various terrain scenery.

Figure 1: The Interface of the Instructional Media. (1)

This instructional media adopts a pattern of self-directed operation and independent study with a large number of image-text information as well as voice materials, which are from natural landscape nearby. Beside the learning level, this media includes a self-challenge, a puzzle, and a Link Game, as well as choice questions and other forms of interaction, for self-examination after classes.

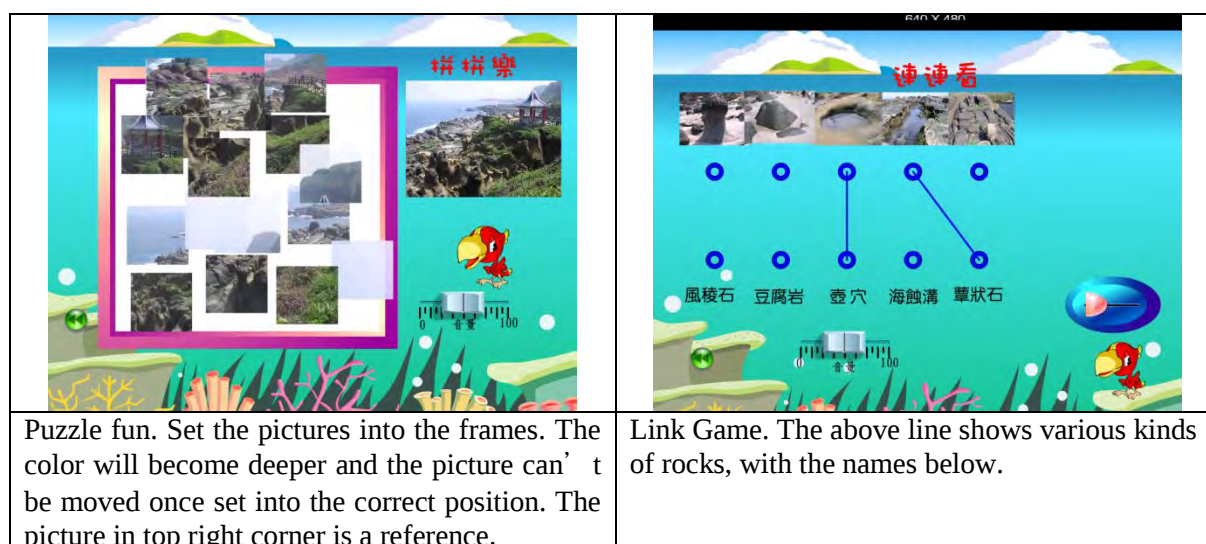


Figure 2: The Interface of the Instructional Media. (2)

3.3 Application of IRS

IRS, the abbreviation of Interactive Response System, is a kind of system used for interacting with teachers and students during the classes, through computers or mobile devices. It was pointed out that IRS could increase learning interest and add more interaction in classes, which gives play to peer instruction well.

This research employed Socrative 2.0 system, a system has something to do with teaching feedback, assessment test and teaching report and could be applied to mobile devices. Moreover, Socrative 2.0 has broken the limits in different platforms, but appeared in the form of WEB. In other words, Socrative 2.0 system could be easily and conveniently operated only if the appliance has a browser in it, and internet service is available in the environment around. In the research, the teachers conduct a pre-test by IRS first, and then with guidance of it, the teachers will refer to the results after a test to shepherd students continuing discussion and in-time interaction. The students can be guided to self-learning by operate the instructional media actively. A test is conducted to test the students before the class ends. The pattern as below:

- (1) To go on a pre-test by IRS.
- (2) To go on class discussion and in-time interaction by IRS
- (3) To go on self-learning by operate instructional media actively for students.
- (4) To go on post-test and collect the attitude by questionnaires.
- (5) To organize and analyze the data.

3.4 Data Compilation and Disposition

In the research, questionnaire could be divided into 2 parts. One is for learning efficiency, and it is the single choice aiming at teaching objectives. Compared with the 2 tests before and after class, it is found that after learning by instructional media, the accuracy of every single choice has risen. If the instructional media has been properly used, the learning efficiency would be improved at the same time. The data are shown in Table 1 below:

Table1: Comparison of passing rate before and after class

No.	1	2	3	4	5	6	7	8	9	10	Average
Pre-test passing rates	62.5	92.9	67.9	35.7	96.4	55.4	73.2	35.7	51.8	41.1	60.4
Post-test passing rates	87.5	100	91.1	66.1	100	89.3	94.6	69.6	82.1	66.1	83.4
Ascensional range	25	7.1	23.2	30.4	3.6	33.9	21.4	33.9	30.4	25	23

Although the passing rate has risen, the passing rates after class of question 4 and question 10 are still flat. Question 4 is “what kind of coastline does northern coastline of Taiwan from Jinshan to Beiguan should be?” The correct answer is “sedimentary rocky coastline”. Question 10 is “what kind of rock does northern coastline of Taiwan from Jinshan to Beiguan should be?” The correct answer is “Sandstone”. While compared with similar question concerning Danshui or Jinshan, the passing rate of reached 91.1%. Most of students didn’t where the Beiguan is after inquiry. Because of the time limitation when operate the instructional media, the passing rate of such questions is lower than other questions.

The questionnaire about learning experience adopted Five-point Likert scale. The questionnaire can be subdivided into instructional media and IRS. Table 2 shows the results. In the first part, all students believe that learning by operating media is happy, and the mean could arrive at 4.71. What’s more, students also think that it’s conformed to their needs to operate instructional media by themselves which is suitable for their tempo and interest, so that they are able to operate several times when they couldn’t understand the point. The mean could reach 4.54. In the part of IRS, most students deem that using IRS in class will drive you pay more attention to class because you have to communicate with teachers all the time. The mean reaches 4.77. Owing to this kind of interactive teaching model, you are able to put up your opinion at once and elevate your learning interest since it is full of freshness. The mean reaches 4.45. The data are shown in Table 2 below:

Table 2: The questionnaire results after the end of the course.

	Strongly Agree	Agree	Ordinary	Disagree	Strongly Disagree	Mean
1.I feel happy to use instructional media for learning	71.4%	28.6%	0.0%	0.0%	0.0%	4.71
2. Operating the instructional media myself meets my learning demand.	62.5%	30.4%	5.4%	1.8%	0.0%	4.54
3. This approach aimed to upgrade my attitude of learning science	30.4%	41.1%	25.0%	3.6%	0.0%	3.98
4. Using IRS during class make me feel at ease without pressure.	30.4%	33.9%	23.2%	7.1%	5.4%	3.77
5. It’s fun to use IRS in class.	55.4%	35.7%	7.1%	1.8%	0.0%	4.45
6. Using IRS in class makes me concentrate better	76.8%	23.2%	0.0%	0.0%	0.0%	4.77
7. I am satisfied with my learning performance.	53.6%	28.6%	12.5%	5.4%	0.0%	4.30

It’s worth noting that although using IRS in class is popular among most students, still 1/8 students feel more stressed compared with traditional teaching method. After tracing the following students, it is found that the instantaneousness from IRS puts more stress to students. They may feel anxious once they cannot answer some questions needed thinking or unable to keep pace with teachers. Some students said that the instructional words were not in Chinese, but in English, and they cannot figure out if this language barrier would put more stress on those poor English students. On the other hand, the learning scale of science and life technology would be wilder and the questions would be more difficult if students go to senior class, still 28.6% student are not favor of this subject even instructional media and IRS are used in class, which should be concerned by related educators.

4. Conclusion

While conducting correlated curriculum of environmental education, the proper usage of instructional media may help learners study happily and improve their learning efficiency if the learners are able to operate the media according to their interest and demand. In this research, the usage of IRS is conducive to attention focusing and learning interest inspiration. However, even in an age where mobile devices is prevailing, many schools are unable to provide enough mobiles for using. Fortunately, superexcellent alternative solution—computer rooms are suggested to replace the former two by each school. Utilizing WEB pattern of IRS, such as Socrative software, can allow teachers and students enjoy many benefits of IRS teaching without any mobile device or special equipment. In addition, IRS may as well assist in dealing with data. It is a kind of facilitating device. However, teachers need to focus on students' stress while using IRS, no matter on operation style or language ports. It is suggested to training teachers proficiently before using it in due form. More importantly, teachers are able to grasp the information about those who are unable to keep pace with class or have less interest in study because of the immediacy of IRS, and show their concern and consideration. The usage of IRS makes students feel excited, thus, educators should acknowledge that machine is not the main role in learning but the proper guidance for teachers. Only through proper application from teachers can the instructional media provide the most value.

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