

Evaluation of Geographic Information System (GIS) Based Teaching Process According to Primary Education Students' Reflective Thinking Skills

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Abstract: It is new to be focused on reflective thinking at geography education. Therefore, this study is thought to be an example for the subsequent studies. The aim of the study is to determine the students' reflective thinking by examining their notes that were taken through the Geographic Information System (GIS)-based application process. The "resources of Turkey" theme was chosen through the GIS application process. The study is a case study within the qualitative research strategies. The area of the study, is Safran Primary School, 6th grade learners in Karabük province, Turkey. The sampling students of the research that participated in the GIS-based learning process are 19 students attending to class 6/B. The evaluation notes of of students written after the process were examined with document review technique. Students' statements were analyzed descriptively. As a result, students expressed their reflective thinking about GIS-based process mostly in a descriptive way. The students that expressed their thoughts critically were less than the ones that stated in a descriptive way. This case indicates that students did not improve their descriptive reflective thoughts through critical reflective thinking. In other words, students were determined not to improved in having a high level thinking skill. The study was completed with recommendations about improving students' reflective thinking skills and their being able to express them.

Key words:Geographical Information System (GIS) • Geography • Reflective thinking • Descriptive • Critical
• Social studies lessons

INTRODUCTION

It is known that GIS technology is given great importance by the educational institutions in various industries, public institutions, military institutions, the private sector and civil society organizations in the world. Geographic Information Systems are known as collecting graphics and all kinds of non-graphic spatial information, storage, associating with each other, updating, querying, analyzing and presenting performing operations as an integrated system consisting of hardware and software components. With this system, the results of studies are presented to other users in the form of maps and graphic representations. Maps are turned into outputs unified with three-dimensional representations, written reports, photos, images and multimedia systems. Turoğlu (2000) describes GIS as covering collecting information, storage and analysis related to the natural environment, human and time properties in each scale and running through its own methodology of Geography Information Systems [1]. In this study, how GIS-based teaching process was

understood and expressed by the students was wondered and therefore primary students' Reflective thinking capabilities in the class was chosen as the subject of research.

Reflective thinking has an important place in the process of evaluating the teachers and students. However, this importance has not been understood until recently. Therefore, the relevant national and international work is very low on the subject. Because there are so few studies led the reflective thinking had a different definition in the researches [2]. Reflective thinking a high level thinking skill based on creating hypotheses, testing hypotheses on the study and, collecting data including the results reaching through inductive and deductive approach [3]. Dewey, defined reflective thinking as considering any thoughts and data or a data structure that supports achieving its intended results efficiently, consistently and in a careful way [4].

According to Schön (1987), reflective thinking enhances students' learning experiences more than learning theoretical formulations. Reflective thinking,

requires the teacher and the student think about what they are actually doing while they are doing something and reviewing it again accordingly. Thus, the students may be conscious and active during the course by questioning what they learn in the process and why. The teacher reviews his activities after the lesson carefully on his own [5]. Unver (2003) defines the reflective thinking as a process of thinking towards the solutions of problems or negative situations about an individual's level of teaching or learning method. When these definitions are taken into account reflective thinking can be considered as the evaluation of an individual's learning environment in the process and correction of errors that occur afterwards [4].

Reflective thinking activities are significant in terms of indicating teacher candidates, teachers or students to express their thoughts in the teaching atmosphere. The results of the surveys help answering the question "what should be considered in improving the competence of individuals for showing the degree of reflective thinking skills of individuals, planning the learning environments and in providing free thinking?".

In their studies Wilson and Jan (1993) state that, reflective activities provide the students identify their goals, taking the their own learning responsibilities, be able to realize and correct their own mistakes [6]. The teacher supports the students, detects problems and provides the solution of this problem. In his research Tillema (2000) have found that that the reflective thinking after the application is more effective in changing the beliefs about the application, than reflective thinking before the application [7].

Evaluation notes that support students' learning and improve their reflective thinking ways has a significant place in students' learning and realizing their individual skills [2]. Reflective thinking has strategies containing questioning the assumptions, investigating, summarizing, preparing optional schedules, comparing that develop their thinking [8]. Larson (2000) stated that in developing an individual's reflective thinking skill and being able to criticise oneself reflective thinking based studies have an efficient role over an individual [9].

GIS was applied in the "resources of our country" unit of the Social studies course. The students wrote down what they experienced throughout this application process, on a notebook called "evaluation notebook". This notebook represents the students' reflective thinking skills based learning process. The reflective thinking capabilities of the students regarding this process were the main purpose of this study. It was only in Coşkun

[2, 10]'s study that was found in the local and international literature. It will both provide a perspective for the other studies and serve as a sample, since it is among the recent studies within the scope of geography education.

Purpose and Problem: The study aims at determining the reflective thinking capabilities of the primary education 6th grade students which were demonstrated on the evaluation notebook which they kept in the social studies course regarding the process after the GIS based learning process. An answer to the question of; "What are the reflective thinking capabilities of the students in the social studies course, related to GIS based learning process?" within the context of this purpose.

MATERIALS AND METHODS

Research Design: The research is a case study being involved in qualitative research design. As Yin (1984) stated in his research, a case study is a research method that investigate the phenomenon in its own environment and is used in cases that the borders between a phenomenon and the related condition are not certain and in condition that contain more than one proof or a source of data. The study is a case study suitable to the integrated case environment design [11]. As Yıldırım and Şimşek (2006) suggest in such a study in this design mostly there may be more than one sub layers or units. More than one analysis would be necessary in such a condition. The discrimination here is related to directing the case towards a coherent and a mere unit or more than one subunits that may be possible occurred. In the first case a coherent one case design, in the second case integrated multicases design is used [12]. In the study, students' reflecting ways of their thinking skills that they expressed in the evaluation notes through the process after the GIS application in social studies was assumed as one case.

Study Group of the Research: The study area of the study is Karabük province, Safran Primary School 6th grade students. And the sampling of the study were 19 students from the 6/B class who participated in the GIS based learning process at the social studies course.

Data Collecting Means of the Research: A GIS based lecture was given to the students on "resources of our country". During the lesson, the GIS presentation was shared with the students through the lesson process, in accordance with the geography curriculum and

evaluations regarding the qualities and features of the lecture presented was asked from the students at the end of the lesson.

In the study, the evaluation notebooks which the students wrote after the GIS based learning process regarding the “resources of our country” theme was evaluated with the document analyzing data collecting method. Document analyzing covers the analysis of the written materials which include information on the phenomenon or phenomena which are aimed to be researched [12]. Çepni (2007) defines document analysis also as documentary observation or documentary scanning. In the document analysis process, first of all, a researcher finds the existing sources for its purpose, reads each source carefully, notes down the necessary information and carries out some evaluation processes based on the notes taken [13].

Data Analysis Method of the Research: In the study, a total of 19 opinions which the students wrote down on their evaluation notebooks were evaluated by means of the document analysis technique. Yıldırım and Şimşek (2006) stated that, data, obtained in the descriptive data analysis are summarized and interpreted according to the predefined themes. Besides, it was mentioned in the same work that, in order to reflect the interviewed or observed individuals’ opinions strikingly, direct quotations are used frequently in descriptive data analysis and that the aim of such analysis is to present the data obtained to the reader in an organized and interpreted way [12].

In the study, the ideas reflected by the students regarding GIS based learning process were considered under two headings, namely; descriptive and critical reflective ideas, as in Şahin (2009) and Coşkun’s (2010a and 2010b) studies [14, 2, 10]. The descriptions regarding the application or the environment were analyzed with the students under one heading during the process. However, their critical thoughts were considered under another heading.

Findings: A GIS based lecture was given to the students on “Resources of Our Country”, in the social studies course for 2 weeks. After the teaching process, the students were asked to evaluate the process. They wrote down their ideas about the process on their evaluation notebooks. The descriptive and critical reflective thinking data that was provided in the students’ notebooks is provided below.

Students’ descriptive Reflective Ideas Related to GIS Based Teaching Process: In Chart 1, the *expressions, frequencies and percentages* about 6th grade students’ descriptive reflective ideas were given.

17 (89 %) of the Students Described How the GIS Based Learning Process Was: “The lesson was very nice. I learned some knowledge about geography. I increased my knowledge. I saw some statistics related to Turkey and the world (Enes Kerem, student at 6/B).

“It was full of enjoyment, pleasure and happiness.” (Cihan Berke, student at 6/B).

“ I think it was very nice. The lesson was very enjoyable” (Serra Derya, student at 6/B).

“The lesson was very good and the theme was my favourite theme”. (Burak Yıldız, student at 6/B).

10 of the Students (53%) Described Teacher in the GIS Based Teaching Process: “The teachers gave a very good lesson. The lesson was not boring. It was completely enjoyable.” (Koray, student at 6/B).

“The teachers gave a very good lesson. I understood the theme very well. The lesson was very enjoyable. I understood well with the examples.” (Aleyna, student at 6/B).

“They taught very well. I learned the complex things or the things that I forgot. I lessened the mistakes or the wuestions that I can not answer in the tests. I liked the GIS programme. The knowledge was useful for me.” (İrem, student at 6/B).

Chart 1: Data Obtained from the Student Evaluation Notebooks for Social Studies Course, GIS Based Learning Process Regarding the Students’ Descriptive Reflective Ideas

Students’ Descriptive Reflective Ideas	Students’ Statements	
	Frequency (Number of Students)	Percentage (%)
During the application, the lesson was good and enjoyable,	17	89
The teacher gave a very good lesson.	10	53
I liked the programme very much.	9	47
I understood beter with the examples given during the application.	5	26

Chart 2: Data Obtained from the Student Evaluation Notebooks for Social Studies Course GIS Based Learning Process Regarding the Students' Critical Reflective Ideas

Students' Critical Reflective Ideas	Students' Statements	
	Frequency (Number of Students)	Percentage (%)
The lesson was boring with GIS.	4	21
The GIS Programme needs to be developed, the programme was not good.	2	11
Two teachers in the lesson was meaningless.	2	11
The programme was so silly.	1	5

9 of the Students (47 %) Expressed Their Thoughts about the GIS Programme: "The GIS programme was so nice. The teachers gave a good lesson. I liked the themes told by the teachers. The lesson was very nice and we learned new things." (Halil Cem, student at 6/B).

"I liked the GIS. I liked the themes that were told. The lesson was so good. We learned useful things." (Mustafa, student at 6/B).

"The lesson was enjoyable. I liked the new programme. I think it is useful for us. This way the lessons will be so profitable. (Beyzanur, student at 6/B).

5 of the Students (26 %) Expressed Their Acquisition about the GIS Programme: "The lesson was very enjoyable and I understood very well. I loved the lesson and became so happy. I assured my knowledge on this topic." (Oğuzhan, student at 6/B).

"The lesson was very enjoyable. I understood well. It was good to study with the help of maps. I understood well with the examples." (Firdevs, student at 6/B).

Critical Reflective Ideas of the Students Regarding GIS Based Learning Process: In the Chart 2, statements, frequencies and percentages regarding the students' critical reflective ideas are provided.

4 of the Students (21 %) Stated That Teaching with GIS Is Boring: "They gave a good lesson and had made comments. Then they assured the theme. They gave the lesson with smiling. But the lesson was boring." (Berkay, student at 6/B).

"I could not comprehend the lesson because it was so fast. I got bored because I knew the topic before. (Tunahan, student at 6/B).

2 of the Students (11 %) Stated That GIS Should Be Developed and it Was Not a Good Programme: "Truely, the programme was not perfect. The programme is a bit complex. I understand well with presentations." (Ömer, student at 6/B).

"The late coming of the programme to Turkey made me upset. You should try to improve the programme. It is meaningless to see two teachers in the lesson." (Rümeysa Elif, student at 6/B).

2 of the Students (11 %) Stated That Two Teachers in the Lesson Are Meaningless: "It is strange to see two teachers in the lesson it was like an inspector in the lesson". (Ayşen, student at 6/B).

1 Student (5 %) Stated That the GIS Programme Is Silly: "I was so bored during the lesson. The programme is so silly according to me." (Hayri, student at 6/B).

RESULTS AND DISCUSSION

The constituents of a curriculum should be formed according to the students, teachers and teaching process, in other words theory and practice is unified so that it should be planned and organized providing to improve reflective thinking skills [15]. Otherwise students' descriptive, especially critical reflective thinking skills do not get improved.

Wilson and Jan (1993) lists the approaches which improves reflective thinking as; learning writings, concept maps, question asking, self questioning, cooperative learning and self evaluation [6]. Among these, with regards to learning writings, Ünver (2003) states that, they are the materials on which the students record their personal thoughts, questions, feelings, changing opinions, reactions, information regarding learning processes and contends. He also asserts that, in these writings, not only lives are defined, but also they include explanations, resolutions and reflections on learning. Thus, he asserts, since the students think on the learning process while they write about the process, reflections will occur and students participate in the learning process more actively, feedbacks may be received. Consequently, he shares the opinion that this will make the applicator teacher plan the process more accurately [4].

Questions On:

- The students' thoughts about the process,
- Their thoughts about the teachers during the process,
- Their thoughts about the GIS Programme,
- Their thoughts about their acquisitions.

Were frequently found in the evaluation notebooks of the students, regarding the social studies course, GIS based learning process, in terms of descriptive reflective thinking. However, the remarkable part is that students do not use descriptive statements regarding the learning environment, other students and the teacher within the process. Students rather used descriptive statements on what GIS offers. While expressing their individual gains, the students did not mention their communication and sharing with other members of the class.

Despite the fact that they used expressions such as "increased my interest, contributed to, made it desirable and it was enjoyable", they did not use expressions about the GIS based learning process, which may answer the question of "why" and "how". A similar perspective can be seen in Coşkun [10]'s study. This finding may be an evidence to indicate that even the students' grades change, their high level thinking skill towards descriptive reflective thinking skills can not be provided through the process.

On the other hand what the students expressed regarding the social studies course GIS based learning process on their evaluation notebooks, in terms of critical reflective thinking, are such statements:

- The lessons were boring with GIS,
- The GIS Programme should be developed and the programme is not good.
- It is meaningless to see two teachers in the lesson.
- The GIS Programme is nonsense.

The students stated their thoughts on GIS more than other students and the teachers. Only two students (Rümeysa and Ayşen) criticized the number of the teachers. When students' descriptive and critical reflective thoughts were examined it was seen that descriptive expressions took place more than critical statements. In this case it can be inferred that students' descriptive reflective thinking skills developed more than their critical reflective thinking skills. This case looks similar to Coşkun [2, 10]'s studies. This demonstrates that students are raised with descriptive characteristics, rather than being critical. When the findings section is analyzed

(Serra Derya, İrem, Oğuzhan, Cihan Berke and Enes Kerem) it may be asserted that, some students could not develop their descriptive reflective thinking towards critical reflective thinking.

Based on the Descriptions of the Students it Has Been Observed That:

- The students's statements related to GIS based learning process are mostly of descriptive character,
- Descriptive reflective thinking skills of the students are developed more than their critical reflective thinking skills,
- Students' could not improve their descriptive reflective skills towards critical reflective thinking skills.
- Students could not reflect ideas on their behaviors and communications during the process,
- Students only had ideas regarding the GIS application and they did not mention process experience,
- Students used descriptive expressions such as "increased my interest, contributed to, made it desirable and it was enjoyable", regarding the GIS based learning process, but they did not use expressions which may be the answer to the questions of "why" and "how" about these expressions. Similar conclusions were reached in the geography course [2, 10]. This case may be an evidence indicating that even the students grades change, students' thinking skills could not be improved through the process.

Suggestions: When the results of the study are taken into consideration, the following suggestions may be made;

- When it is considered that reflective thinking supports questioning and creative problem solving skills, which aims at attaching importance to or prioritize others' feelings, the teacher sometimes needs to take feedbacks from the reflective thinking applications.
- Teacher should encourage the students to move forward to critical reflective thinking capability, from the descriptive reflective thinking skills, aiming at the self confidence of the students.
- Teachers should pay attention to the activities aiming at reflective thinking in the courses.
- Teachers should be given vocational training courses by the Ministry of Education, in order to increase their knowledge and experience about reflective learning.

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