PHYSICS STUDENTS' PERCEPTIONS ON THEIR JOURNEY THROUGH PORTFOLIO ASSESSMENT

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Abstract: Despite the approbations for the use of portfolio assessment, there are limited number of studies that have looked at the portfolio assessment from the students' point of view. The purpose of this study was to find out students' perceptions about portfolio assessment. A multi-case study design was utilized for the research in order to focus on students' perceptions within several examples. Participants of the study were nine nine-grade high school students. Portfolio assessment was implemented for eight-week duration in a physics course. Data were collected by written documents and interviews. The participants' perceptions were explored based on the codes such as benefits, enjoyable parts, and problems of the portfolio assessment. Although some problems, students' perceptions on portfolio assessment were generally positive.

Keywords: Portfolio assessment, perception, physics.

1. Introduction

In a constructivist learning environment, teachers focus on developing instructional assessments that enhance each student's learning potential, especially when students are in various learning strategies (Pilcher, 2001). There are relations among the assessment tasks as students perceived it, their perceptions of their ability to do the tasks, their effort, and their achievement (Brookhart & DeVoge, 1999). Since the primary goal is to improve learning, educators are moving towards creating the collection of student work overtime. One sign of this movement is the growing interest and use of portfolios.

A portfolio can be defined as a purposeful, systematic process of collecting and evaluating student products to document progress toward the attainment of learning targets. A goal for a high school student's portfolio, for example, might be to collect evidence from many sources over a period of ten weeks of how the laws of physics influence daily life and the use might be for the teacher to assign a grade in the physics class (Collins, 1992). According to Wiggins (1993), if a test or quiz represents a snapshot (a part of the learning at a specific moment) then a portfolio is more like a photo album - a collection of pictures showing growth and change over time. Arter and Spandel (1992) point out that portfolios

involve student participation in the selection of what is included in the portfolio, specific and predetermined guidelines for the selection of materials and criteria for scoring, and evidence of student self reflection on what has been accomplished.

2. Objective of the Study

Despite the recommendations for the use of portfolio assessment, there are limited number of studies that have looked at the portfolio assessment from the students' point of view. The purpose of this study was to find out physics students' perceptions about portfolio assessment.

3. Methodology

A multi-case study design was utilized for the research in order to focus on students' perceptions within several examples (Bogdan & Biklen, 1998). Data triangulation was achieved by using variety of data sources in the research (Denzin, 1978). Triangulation was emphasized for the reason of presenting meaningful propositions and to reduce the bias inherent in qualitative research (Mathison, 1988).

3.1. Participants

Participants of the study were nine (three females and six males) nine-grade high school students. These students were selected by stratified random sampling among 30 students in a classroom according to their efforts in creation a portfolio. Participants' names were coded as S1 through S9 in order to provide anonymity. While S1, S2, and S3 showed little effort; S4, S5, and S6 showed moderate effort. S7, S8, and S9, on the other hand, were selected from the students who showed the highest effort.

3.2. Portfolio Assessment

Portfolio assessment was implemented for eight-week duration in a physics course where the subject was geometrical optics. The course was two hours per week. This was the first time that the students were creating a portfolio. Therefore, they were informed about the portfolio assessment at first and some informational documents were distributed to them.

The content of the portfolio was prepared by two authors together by taking the following steps: First, learning goals were identified by considering the research on students' misconceptions in optics (Bendall, Galili, & Goldberg, 1993; Colin & Viennot, 2000; Galili & Hazan, 2000). Second, performance objectives were determined based on the learning goals. Third, tasks were prepared based on the performance objectives. There were 16 tasks in the

portfolio related to writing essays, doing individual projects including experiments, and interpretation of some class activities. Finally, one scoring rubric and some reflective questions were prepared for the each task. The rubrics and questions offered opportunities for self-assessment and reflection. The teacher and the students met five times and talked about the students' performances. During the implementation, the students were filled in the K and W (what I know, what I want to know) columns of the KWLH chart before teaching a physics concept or a law. After teaching, they filled in the L and H (what I learned, how I learned it) columns of the chart.

3.3. Data Collection

Data were collected from written documents and interviews. The written documents were the participants' responses to the reflective questions and to the H column of the KWLH charts. The reflective questions were related to the process followed to do the task, problems experienced while doing the task, the most beneficial part of the task, the most enjoyable part of the task, effects of the task on skills, and personal attribution discovered while doing the task. The interviews were semi-structured and conducted after the participants completed their portfolios. The interview questions were similar to the reflective questions but they were related to the portfolio assessment rather than the particular task. In addition, during the interviews the participants were asked their overall thoughts about portfolio assessment.

3.4. Data Analysis

In order to examine the participants' perceptions about portfolio assessment, data gathered from the written documents and interviews were analyzed to find patterns. Data analysis was done using both within-case and cross-case approaches (Miles & Huberman, 1994). The codes were developed based on the themes asked in the reflective and interview questions. The codes were benefits, enjoyable parts, attribution discovered, skills developed, problems, and overall thought. The participants' perceptions were explored based on the codes.

4. Results

The students' perceptions on portfolio assessment are presented in Table 1. Regarding within-case results, S1's overall thought about portfolio assessment was negative. S1 was a disorganized student who had little interest to physics. He did not like the idea of portfolio assessment and he completed only the first portfolio task. Although he enjoyed performing the experiment at home, he declared that doing the tasks took too much time. He added that he

Table 1. The students' perceptions on portfolio assessment

S.	Benefits	Enjoyable Parts	Attribution Discovered	Skills Developed	Problems	Overall Thought
S1	* Acquisition of more knowledge * Making relationships between physics concepts and daily life events * Learning the content faster	* Doing home experiments	* Interest in doing research	*None	* Writing of ideas * Inadequate resources * Taking too much time	Negative
S2	* Acquisition of deeper knowledge * Repeating	* Learning new things * Feel like a scientist	* Like doing experiment	*Research skills	* Too many tasks * Ambiguity in some tasks * Taking too much time	Positive
S3	* Durability of understanding * Repeating * Making relationships between physics concepts and daily life events	* Doing research * Doing home experiments	* Can do research * Can do experiment * Bad writing skills	*Research skills	* Inadequate resources * Insufficient explanation in some tasks * Struggle in interpretation of information reached	Positive
S4	* Durability of understanding * Acquisition of more knowledge	* Plotting diagrams	* Can be a better researcher * No need to afraid of physics * Can take responsibility	* Research skills * Writing skills	* Inadequate resources * Ambiguity in some tasks * Insufficient time	Positive
S5	* Repeating * Durability of understanding * Making relationships between physics concepts and daily life events	* Plotting diagrams	* Can do things in order * Have patience	* Writing skills * Interpretation skills	* Writing of ideas * Ambiguity in some tasks	Positive
S6	* Durability of understanding * Participation to lessons * Acquisition of more knowledge	* Doing home experiments * Feel like a scientist	* Can do experiment * Bad interpretation skills	* Research skills * Science process skills	* Inadequate resources * Taking too much time	Positive
S7	* Learning new things * Repeating	* Doing research * Plotting diagrams	* Can do research * Can learn physics * Can learn faster when the teacher does lecture * Doing experiment is boring	* Writing skills * Interpretation skills	* Inadequate resources * Taking too much time	Almost Negative
S8	* Durability of understanding * Learning new things * Making relationships between physics concepts and daily life events * Improvement in cultural knowledge	* Doing research * Doing home experiments * Learning new things	* Like doing research * Good interpretation skills * Good writing skills * Have patience	* Research skills	* Inadequate resources * Taking too much time	Positive
S9	* Durability of understanding * Making relationships between physics concepts and daily life events	* Plotting diagrams * Doing experiment * Feel like a scientist	* Can plot like an engineer * Like doing experiment * Can learn physics	* Writing skills * Interpretation skills	* Inadequate resources * Taking too much time	Almost Positive

could not reach enough resources and he struggled with writing his ideas. He could not develop any skills during the portfolio assessment even though he discovered that he was interested in doing research.

S7 was a student who had self-confident and could express herself freely. She showed very high effort during preparation of her portfolio and completed all the tasks. She said that:

> "I found a chance to repeat the content we discussed in the class and learned many new things while I was preparing my portfolio. I enjoyed doing research in order to do the tasks. Preparing this portfolio made me realize that I could learn physics……. I believe that both my writing and interpretation skills were improved during this assessment process"

However, S7's overall idea about portfolio assessment was nearly negative because she thought that she could learn faster when the teacher did lecture instead of she did research herself. She also complained about inadequate resources and the time spent to complete the tasks.

S9 completed all the tasks as well. She expressed that preparation of the portfolio provided her for being able to make relationships between physics concepts and daily life events. She enjoyed doing experiment and felt like a scientist. S9 noticed that she could plot like an engineer and her writing and interpretation skills got better. Nevertheless, she was not completely positive about the portfolio assessment. She explained the reason as following:

> "We take both science courses and social science courses this year (nine-grade). There are too many courses. I do not think that portfolio is appropriate for nine-grade because it requires too much time. Portfolio assessment can be implemented in upper grades where we have opportunity to decide which courses we take."

Other six students (% 66.6) were all positive about the portfolio assessment. One of these students, S8, stated that:

> "I did not like the idea of portfolio assessment in the beginning. I could not do the writing well for my tasks. But then, I realized that preparation of the portfolio was not that difficult. Instead, it was fun. I learned how the physics concepts worked in our daily lives while I was doing the tasks. My writing skills were also improved during this process."

S8 was a self-motivated and well-organized student who was successful as well. She completed all the tasks in the portfolio. Although she expressed displeasure about the time which was not enough for her to prepare the portfolio file as she wanted, she had positive attitude towards portfolio assessment.

S3 showed little effort during the process and completed 11 tasks out of 16. He was known as introvert student who did not have much interest in physics. He did not like challenging himself and pushing his limits. Nevertheless, his perception about portfolio assessment was positive. He explained that:

"I struggled to interpret the information I reached and could not write my thoughts. But at the end, I did not forget what I learned while doing my tasks."

Cross-case results presented that acquisitions of more and deeper knowledge, learning new things, durability of understanding, making relationships between physics concepts and daily life events, increase in participation to lessons, and improvement in cultural knowledge were the benefits of the portfolio assessment. The students stated that doing home experiments, doing research, learning new things, plotting diagrams and feeling like a scientist were the enjoyable parts. They discovered that there was no need to afraid of physics. Moreover, after self-evaluation the students found out that they could do research as well as experiment and could actually learn physics. In terms of the effects of the portfolio assessment on the skills that the students developed; research, writing, interpretation, and science process skills were the common ones. Unable to reach a sufficient amount of resources, ambiguity in some of the tasks, spending too much time to complete the tasks and having difficulty in writing of their ideas were among the problems created during the portfolio preparation.

5. Conclusion and Implication of the Study

Results of the study show that the students appreciate for the positive effects of portfolio assessment on learning. They are also pleased about doing what scientists do under the scope of the portfolio tasks. Teachers generally cannot find enough time to integrate inquiry into classrooms as a result of the limited number of weekly hours and heavy content of the curriculum. The students in this study did some inquiry investigations in order to complete the tasks. Therefore, they could find a chance to improve their research skills. Furthermore, the students are glad about their enhanced writing skills in consequence of writing essays and experiment reports. The problem about reaching inadequate resources is normal considering that these students are generally used to utilize textbooks as the only resource. Other problems the students possess can be eliminated by reviewing the content of the tasks and decreasing the number of the tasks. In conclusion, students' overall perception on portfolio assessment is positive. Portfolios do not only address students' progress but also increase their learning.

This study has implication by adding students' point of view about portfolio assessment.

References

Arter, J., & Spandel, V. (1992). Using portfolios of student work in instruction and assessment. *Educational Measurement: Issues and Practice*, 11(1), 36-44.

Bogdan, R. C., & Biklen, S. K. (1998). *Qualitative research in education: An introduction to theory and methods.* Needham Heights, MA: Allyn & Bacon.

Brookhart, S. M., & DeVoge, J. G. (1999). Testing a theory about the role of classroom assessment in student motivation and achievement. *Applied Measurement in Education*, 12(4), 409-425.

Collins, A. (1992). Portfolios for science education: Issues in purpose, structure, and authenticity. *Science Education*, 76(4): 451-463.

Denzin, N. K. (1978). *The research act: A theoretical introduction to sociological methods* (2nd. Ed.). New York: McGraw-Hill

Mathison, S. (1988). Why triangulate? *Educational Researcher*, 17(2), 13-17.

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook* (2nd ed.). Thousand Oaks, CA: Sage.

Pilcher, J. K. (2001, March). *The standards and integrating instructional and assessment practices.* Paper presented at the 53rd Annual Meeting of the American Association of Colleges for Teacher Education, Dallas, TX. (ERIC Document Reproduction Service No. ED451190).

Wiggins, G. (1993). *Assessing student performance: Exploring the purpose and limits of teaching*. San Francisco, CA: Jossey-Bass Publishers.