The Influence of Students' Expectations on Their Interests in Physics Lessons

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Abstract. The purpose of this paper is to present results of the study conducted to explore students' expectations related to development of student interest in physics and physics lesson. The concept of interest is the affective description of this connection between person and objects. Even though interest is assumed to be important for its role in learning concepts, studies are not sufficient to explore students' expectations that play important role for sustaining interest. Person-Object Approach to Interest, as a theoretical approach underlying Self Determination Theory, explains interest as a relatively enduring relationship between a person and objects in his or her daily-life experiences. For the purpose of the study tenth grade students were interviewed. The interview questions were semi structured and aimed to elucidate the categories that explain the relationship between students and interest objects from daily life related to physics lesson. Results support that students' basic needs need to be fulfilled, and feeling and value related expectations should be met to stimulate students' interest. Findings of this study suggest reconsidering students' expectations from a physics lesson for their interest in physics lesson.

Introduction

Physics, as a field of science, provides information which students may use to explain daily-life phenomena related to objects around them. The concept of interest is an affective description of this relationship between students and objects. The degree of the strength of this relationship also may represent levels of student interest in physics. In addition, students' prior experiences with objects in daily life may play important role in stimulating students' interest in physics and the physics lesson (Krapp, Hidi, & Renninger, 1992). Concepts of physics are considered to be difficult for students to learn (De Lozano & Cardenas, 2002). Even though students bring their ideas to the physics classroom, they have difficulty connecting it to the concepts taught in the lesson. Students' interest plays an important role in the accommodation of concepts (Palmer, 2005). On the other hand, recent research shows that there is a considerable decrease in students' interest in physics and physics by grade level (Hoffman, 2002).

Most research on student interest focuses on only formal learning contexts. In such contexts, it is difficult to observe students' emotional beliefs related to their expectations from a physics lesson. Students whose expectations are not met in physics lessons may loose their

interest. The purpose of this qualitative study is to explore students' expectations related to development of student interest in physics and physics lesson.

Theoretical Framework

Self-Determination Theory (SDT) is a theory of motivation that discusses whether motivated actions are controlled or self-determined, that is, involving volitionally or compelled by intrapersonal factors (Deci & Ryan, 2000). Self Determination Theory combines psychological needs and factors in environment. The needs are accepted as innate for all human beings and need to be satisfied for individual development. Maslow's hierarchies comprise the fulfillment of the basic biological needs rather than psychological needs (Krapp, 2005b). Deci and Ryan, pioneers of Self Determination Theory assert that not only biological needs but also psychological needs are to be fulfilled (Krapp, 2005b). With regards to Self Determination Theory, three basic needs have been discussed: competence, autonomy and social relatedness. The need for competence is to feel effective, competent to be able to do an activity for a valuable goal, and competent to interact with the environment. The need for autonomy is to feel independent from internal and external factors by acting for him/her (Krapp, 2005b). The need for relatedness is to feel belonging to a social group, the need to interact with others and accepted as significant by others (Ryan, & Deci, 2000).

The fulfillment of basic psychological needs plays an important role in interest development according to Person-Object Approach to Interest. Need-related experiences are related to maintaining lasting interest. When basic needs are fulfilled, positive interest-related actions can be experienced as proposed by SDT (Krapp, 2005b). Person-Object Approach to interest is a theoretical approach underlying Self Determination Theory. This approach elucidates interest-related concepts from a person's interaction with his/her environment (Krapp, 2002a).

Person-Object Approach explains interest as a relatively enduring relationship between a person and objects in his or her daily life (Krapp, 2002a). Person and objective environment constitute a bipolar unit. Objects of interest do not refer only to a concrete thing (a topic, a musical instrument) but also an abstract thing (an idea) (Krapp, 2002a). Interest concept is related to "curiosity" (Krapp, 2002a), "valances" (Schiefele, 1999), and "flow" (Schiefele, 2001).

According to this approach there are two main types of interest: Situational Interest and Individual Interest. Situational Interest is stimulated by the learning environment (Schiefele, 1999). For example, instructional materials or class context provided by the teacher can stimulate student Situational Interest (Ainley, Berndorf, & Hidi, 2002). Situational Interest as interestingness of the learning environment catches a person's interest initially. This short-term interest is called the Catch component of situational interest. It is sustained as long as the conditions continue. If this short-term interest is continued even when the conditions are over, this form of situational interest is called the Hold component of interest (Krapp, 2002). Individual Interest is a long-term form of interest that has an enduring and stable orientation toward the object without the requirements of situation (Krapp, 2002a). Even though the source, effects, and objectives have been discussed, it is widely accepted that interest has an important role in learning. Also, in the process of learning, interest and motivation explain some questions related to the process of learning (Schiefele, 2001).

With regards to the SDT, interest includes feeling-related and value-related valences (Schiefele, 2001). Value-related valences refer to person's expectations from interest objects to have significant experiences for his or herself. Feeling-related valences refer to person's expectations from interest objects to have experiences that make them feel positively. A person

will engage with the interest objects if he feels positively about them and gives value to them (Krapp, 2002a). The extension of these engagements may affect individual interest in objects.

Theories on the development of interest explain how objects of interest stimulate the development of a person's interest and which conditions may result a sustaining interest. (Krapp, 2002) developed some models to explain the development of interest. Channeling Model explains the development of interest as a reorganization of the relationship between a person and objects in environment. Specific parts of the environment become more interesting than others. Relationship with objects is reformed through channeling. Growth Model is a normal way of interest development. While person is growing up it is getting more complex and feeling-related valances or value-related valances are more focused. According to Overlap Model, realizing there is an overlap between two independent objects stimulates a person's interest. Initially the person is already interested in an object then realizes the overlap with other objects. He thus becomes interested in the other object too (Krapp, 2002).

Curiosity refers to the relationship between person and object in terms of exploratory behavior. Curiosity is different than interest regarding the variety of interest objects. Curiosity is a stimulant to trigger a person's interest to interact with his or her environment. The activities should be novel, complex, unusual and in conflict for a person. They capture student attention because his or her curiosity is evoked. A person's curiosity can precipitate situational interest. (Ainley, 1998)

Flow is a motivational concept to explain the individual behavior of a person completely engaged with an activity without consciousness. A flow behavior can be associated with intrinsic motivation, and individual interest, strong emotional and value-related beliefs, self efficacy, clear goals, and the ability to self-regulate one's behavior. A person does not need stimulating

conditions in an environment. A person with flow behavior believes that he/she is skilled and able to do a challenging activity (Krapp, 2002).

Method

The sample of this study consists of five students from the 10th grade, 3 male and 2 female, from a private school in an urban city. The sample students were selected by their physics teacher to represent a wide range of interest levels.

A pilot study, fifteen interview questions were developed and administered to volunteers from 10th grade students to assess the feasibility of the study.

The Interview questions were semi-structured and aimed to elucidate the categories that explore relationships between students and objects related to physics in their daily-life experiences. The interviews lasted about one hour. The lines of students' responses were followed and probed in depth to clarify students' responses.

Transcripts of students' responses to interview questions were independently analyzed to establish inter-rater agreement on categories related to students' expectations and sustaining interest in physics. Finally, researchers reviewed together to have consensus on the cohort views of factors. The data included transcripts of interviews with students. From the row data transcripts were re-examined and organized into related categories (it can be seen in Table).

Results

In this section, results of the analysis of transcripts are explained by categories and students' responses to interview questions are provided in the table.

ST1 feels competent and feel of autonomous. ST2 also feels autonomous but does not feel competent for tasks in physics class. ST3 and ST5 both feel autonomous and competent. ST4 feels the fulfillment of basic needs (competence, autonomy, social relatedness).

ST1's feeling-related and value-related valences were influenced by her competency. ST1's feeling-related valances shift at 10th grade and basic needs and value-related valances shift too. ST2 likes science overall but she asserts that he likes it more than physics, chemistry and biology. ST3 and partially ST4 have both feeling and value-related valances. ST5 likes physics lesson, has feeling-related valences but not value-related valances.

Since ST1 does not feel fulfillment of basic needs and valances, tasks in physics are more difficult for her. ST2 and ST4 also claimed that they were not successful because of the difficulty level of tasks in physics. On the contrary, ST3 claimed tasks and exams in physics class are easy.

ST4 has been interested in physics for a long time. But ST4 is interested in physics because he has taken physics classes. His interest in physics is not associated with his interest in other fields, or he did not carry his interest out of school activities. His interest focuses on activities in physics class rather than experiences related to physics in daily life. Consequently the development of ST4's interest can be explained by growth model.

ST3 is curious and likes searching about interest objects related to physics, even though it is not a requirement of the physics lesson. Moreover, ST3 is interested in a variety of fields (Scientists' lives, science fiction, maquette, and drawing) most of them are related to physics. He retrieves information about these subjects and particularly is interested in physics for a long time. This fits the *overlap model* of interest development.

	STUDENT ONE (ST1)	*STUDENT TWO (ST2)*	*STUDENT THREE (ST3)*	*STUDENT FOUR (ST4)*	*STUDENT FIVE (ST5)*
Autonomy		"…Even though I like classes like physics, chemistry, and biology in this year I can't say I could do well…"	"…(When) I have an exam, others can't do and in panic, just like a game (to me), I solve (problems) like I am solving puzzle, ….I don't care, I don't care even I get 1 (over 5) that is, (the relationship) is unbreakable with physics..."	"…I want to continue my education because teachers affect us a lot in school…"	"… (I choose science department) I have already enjoyed with Mathematics, I am also interested in physics very much…"
Competence	"…I was able to do all tasks when I was 9th grade…"			"…I like physics and I believe I can do tasks. For this reason I want (to choose) physics…"	"… There is no way they (theories) are right and should be disproved. Sometimes I think I can disprove them…"
Social relatedness				"…I loved my science teacher very much when I was in primary school. I love my physics teacher in this school…"	
Feeling-related valances	"… I noticed that I don't enjoy when I study physics or chemistry anymore. Still I am successful…"		"…I like physics very much, it attracts me, like (drawing) picture, I feel relaxed…"	"…I like physics and I believe I can do tasks…"	"…Physics get my interest very much …But, you see, I enjoy with it …particularly laboratories are very joyful in general…"
Value-related valances	"…I choose science division and my goal was to be an engineer at a University…		"…I want to be engineers…I often think by myself that I am where physics and mathematics are…"	"…I want to be either department of economy or physics…"	
Curiosity			"…I like searching, like torque equations. I am also curious why this chair in balance is now..."		
Difficulty level	"…Because I couldn't have done well, I put too much effort on tasks in physics..."	"…I study hard (strong emphasis) but I can't be success full in any way…"	"…just like a game (to me), I solve (problems) like I am solving puzzle …"	"...tasks in physics lesson are difficult...very heavy curriculum..."	"…none (physics, chemistry, and biology) of them is difficult for me…"
Choice			"I hope to be a mechanical engineering... Tell me another subject where physics and math are together..."	"… I want (to choose) physics…."	
Flow			"…Even if I am at home, I do some calculations for my sake, surely at my level…"		

Table: Categories and examples from students' responses to interview questions

Conclusions

The patterns drawn from analyses of students' responses support that quantitative method is inadequate due to the high numbers of extraneous variables on student sustaining interest. Qualitative analysis of students' interviews on their interests helps to actualize concepts of students' expectations that help to stimulates students' interest in physics lesson. Results support that students' basic needs need to be fulfilled, and feeling and value related expectations should be met to stimulate students' interest. Findings of this study may suggest reconsidering students' expectations from a physics lesson for their interest in physics lesson. Consequently, results may suggest considering feeling and value-related expectations from a physics class from daily life experiences in developing theoretical frameworks for further studies on interest in physics. Since individual differences in prior experiences have gained more interest in recent studies, the results of this study can be a considerable step in the literature of science education and learning psychology.

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