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The Role of Self Directed Learning on Conceptual Structures of Students' in Internet-Assisted Environments

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Abstract: The purpose of this study was to determine self-directed learning readiness levels of prospective teachers, to determine their cognitive structures and conceptual understanding in the topic of hybridization and bonding via flow maps in internet-assisted environments and to examine the impact of self-directed learning skills on their cognitive structures and conceptual understanding in the topic of hybridization and bonding in internet-assisted environments. Sample of the study was 50 prospective teachers who study in Hacettepe University Faculty of Education Department of Secondary Science and Mathematics Education and studied Basic Chemistry I course. Data were collected via self-directed learning readiness scale developed by Guglielmino [1] and flow maps. Analyzing data, it was found out that self-directed learning readiness was a significant predictor of conceptual understanding of prospective teachers (R^2 =0.13, $p<0.01$).

Key words: Self-directed learning readiness · Flow maps · Cognitive structure · Hybridization and bonding

INTRODUCTION

In today's world, computers and internet have come to be a part in the educational system because of the developing technology. This period of change has brought along some alterations also in qualities which students should have. One of the most important goals of information age is to bring up individuals capable of questioning, eager for searching, inclined for cooperating and capable of adapting old knowledge to new situations [2]. In addition, it is stressed that individuals' taking the responsibility of their self-learning and abilities is crucial. Recently, educational researchers have started to concern themselves with topics whereby students will develop and direct their self-regulated academic learning [3]. The concept of self-directed learning gradually gains importance. Self-directed learning is defined as the capability of individuals to determine their own learning needs and objectives, to detect necessary human and material resources without the help of others and to evaluate the acquisitions of learning by determining the appropriate learning strategies [4]. Students with high level of self-directed learning skills are individuals who can use their problem solving skills, participate in independent learning activities and plan their self-learning [4-10]. Hanna, Dudka, Runlee [11] posited that self-directed learning is the key concept for a successful online learning. Corbeil [12] examined the impact of self-directed learning skill on academic achievement in online learning environments. It was found out in this study that self-directed learning skill is the predictor of academic achievement.

This study examined the impact of self-directed learning skills on cognitive structures and conceptual understanding of prospective teachers in internet-assisted environments. Flow maps were utilized in order to determine cognitive structures and conceptual understanding of the students. Basic reason behind the flow map process is the revealing of ideas describing the phenomenon which respondent observes in the expressions or forms in his/her mind. In this process, expressions of respondents are analyzed; the order and place of their ideas as well as the relationships between them are mapped in the form of diagram. In accordance with the flow map formation process suggested by Anderson and Demetrius [13], flow maps are formed according to the following steps: Revealing of respondent's knowledge via various questions, Showing the flow of thought as expression string linked with arrows, Showing the related expressions with repeating arrows, Numerating each expression and recording the time elapsing while recalling the information [14].

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Cognitive structure is a hypothetical construct showing the organization of concepts in long-term memory of the learner and the relationship between them [15,14]. By revealing the cognitive structures of students, their knowledge and alternative concepts could be determined and concepts and relations in individuals' minds could be analyzed [14].

Purpose of the Study: The present study aims at; 1. Determining self-directed learning readiness levels of prospective teachers, 2. Determining their cognitive structures and conceptual understanding in the topic of hybridization and bonding via flow maps in internet-assisted environments, 3. Examining the impact of self-directed learning skills on their cognitive structures and conceptual understanding in the topic of hybridization and bonding in internet-assisted environments.

Research Questions: 1. How are self-directed learning readiness levels of prospective chemistry teachers? 2. At which level are their cognitive structures and conceptual understanding in the topic of hybridization and bonding after internet-assisted environments? 3. What kind of an impact do self-directed learning skills have on their conceptual understanding in the topic of hybridization and bonding in internet-assisted environments?

MATERIALS AND METHODS

Sample: Sample of the study is 50 prospective teachers who study in Hacettepe University Faculty of Education Department of Secondary Science and Mathematics Education and take Basic Chemistry I course.

Data Collection Tools

Self-directed Learning Readiness Scale: Self-directed learning readiness scale (SDLRS) was developed by Guglielmino [1]. It contains 58 items. Evaluation is made with 5 point Likert type scale [8]. Eight factors relating self-learning are measured in the scale. They are Openness to Learning Possibilities, The Concept of Being a Self-effective Student, Learning Independence, Taking the Responsibility of Someone's Learning, Loving Learning, Creativity, Positive Orientation To The Future, Use of Basic Skills in Problem Solving. Scores to be achieved in the scale are between 58 and 290. [8]. Validity of SDLRS is provided through construct validity and content validity. Content validity was provided by taking expert opinion while developing the scale. Construct validity has been supported by many researchers since 1981. The very last reliability of SDLRS was found as 0.91 via Split-half Pearson Product Moment Correlation with a 3151 persons-sample from United States of America and Canada [8]. The researcher adapted the scale into Turkish by translating it and reliability was found out as 0.75.

Flow Maps: Flow maps were used in order to determine prospective chemistry teachers' cognitive structures and conceptual understanding in the topic of hybridization and bonding after internet-assisted environments. Researcher prepared flow maps according to the procedure of Anderson and Demetrius [13] in accordance with the answers given by prospective teachers to two open ended questions relating the topic. Flow map scores were calculated by computing the number of linear and repeating linkages. In this way, cognitive structures and conceptual understanding of prospective teachers were determined. Maximum score to be achieved in flow maps is 36. Reliability of flow maps was calculated by the researcher and another researcher expert in his/her field according to the procedure of Anderson and Demetrius [13]. The Pearson correlation coefficient (r) for each student for linear linkages ranged from 0.85 to 0.93.

The Implementation Steps of the Study: At the beginning of the applications, self-directed learning readiness scale was administered to prospective teachers. After the topic of hybridization and bonding is roughly revised, prospective teachers were required to reach the information relating these topics in the internet environment. Then, they were asked to reach the websites where they could reach the presentations, figures and animations relating the topic and they could perform practices and quizzes by themselves and study the topic. During these applications, researcher controlled the studies conducted in the class environment. After that, following questions were addressed: What is hybridization, how does it emerge? What are the types of hybridization? What is chemical bond? What are the types of chemical bond and how do they emerge? Flow maps were prepared for each prospective teacher according to the answers given by the prospective teachers.

RESULTS

With regard to the first research question, self-directed learning readiness levels of prospective teachers were determined. Table 1 shows descriptive statistical results relating self-directed learning readiness scale.

Table 1: Descriptive statistical results relating self-directed learning readiness scale

N	Minimum	Maximum	Mean	Std. Deviation
50	186	286	236	20,44

Table 2: Descriptive statistical results of numbers of linear linkages calculated via flow maps

N	Minimum	Maximum	Mean	Std. Deviation
50	1	28	13,1	6.80

As it is seen in Table 1; scores achieved by prospective teachers in self-directed learning readiness scale are 286 at maximum, 186 at minimum while their mean is 236. These results demonstrate that self-directed learning readiness scale scores of prospective teachers are above the average.

With regard to the second research question, cognitive structures and conceptual understanding of prospective teachers were determined via flow maps prepared. Table 2 presents descriptive statistical results of numbers of linear linkages calculated via flow maps.

As it is seen in Table 2; the number of linear linkages in flow maps prepared by prospective teachers is 1at minimum, 28at maximum while their mean is 13, 1.

In third question, the impact of self-directed learning readiness on cognitive structures and conceptual understanding of prospective teachers in the topic of hybridization and bonding in internet-assisted environments was examined. To this end, regression analyses were made and it was concluded that self-directed learning readiness is a significant predictor of conceptual understanding of prospective teachers (R^2 =0.13, $p<0.01$).

DISCUSSION AND CONCLUSION

At the end of the analyses made with regard to the first sub-question of the research, it is seen that self-directed learning readiness scale scores of prospective teachers are above the average. These results indicate that prospective teachers can use their problem solving skills in a good way, they can participate in independent learning activities and they can plan their self-learning. In the second sub-problem of the research, flow maps prepared by prospective teachers were examined and the mean score obtained was determined as 13.1. Prospective teachers used just linear linkages in flow maps and they could not be very successful in establishing relationship between the concepts. Topic of hybridization and bonding appears abstract to the students and even though they perceive the concept of hybridization by definition, they have problem in making sense of it in a three-dimensional way. The concept of bond formation does not completely stick in their minds. In third sub-problem of the research, the impact of self-directed learning readiness skills on cognitive structures and conceptual understanding of prospective teachers in the topic of hybridization and bonding in internet-assisted environments was examined. At the end of data analysis, it was concluded that self-directed learning readiness is a significant predictor of conceptual understanding of prospective teachers. These results are in accordance with findings in the study of Chu and Tsai [16]. Chu and Tsai found out that self-directed learning has an important role in achievement in the internet environment. Considering that internet-assisted education is an inevitable phenomenon of today's world, all the factors affecting the achievement in this environment are important for educators. It is of great importance that future educators are brought up as individuals capable of taking the responsibility of their self-learning and enjoying learning and searching. In this sense, importance should be placed on bringing up prospective teachers as individuals capable of using the technology; and activities to develop self-directed learning skills should be allocated space while preparing the education programs.

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