Relationships between Occupational Therapy Faculty's Preferred Learning Style and Questioning Taxonomy

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Abstract

Effective teaching is a judicious dance between content knowledge, understanding of learning and application of pedagogical skills to promote deep learning. Questioning is an effective pedagogical tool to promote and assess learning. However, studies on questioning have yielded low level taxonomy questioning in classrooms, consequently promoting surface learning. While there are many factors that contribute to pedagogical and questioning skills one would ponder what relationship a teacher's preferred mode of information processing might have with their questioning patterns. This study investigated the relationship of preferred mode of information processing using Kolb's Learning Styles with Aschner and Gallagher's Taxonomy of questioning.

Introduction

Research data have yielded that teachers ask low level taxonomy questioning patterns in the classrooms predominately 50-80% of the time, however, it is still unclear what influences these patterns (Anderson & Burns, 1989; Cotton, 1988 & Barnes, 1983; Dantonio, 1990; Tienken, Goldberg & Dirocco, 2012). There is a lack of research to determine the relationship, if any, between teachers' preferred learning styles and the taxonomy levels of classroom questioning patterns. Experiential learning and information processing is the theoretical framework for this study. The term learning style "attempts to explain learning variation between individuals in the way they approach learning tasks" (Toye, 1989, 226-227). According to Cranton (2005) learning styles are "preferences for certain conditions or ways of learning, where learning means the development of meaning, values, skills and strategies" (p. 362). This study is using the term learning style, to explain and accommodate individual differences in learning or preferred information processing styles. Curry (1983) classified three categories for learning styles: (a) learning styles with instructional preferences, (b) information processing preferences for learning, and (c) cognitive personality styles. These categories were deemed to account for different aspects of learning styles and to facilitate a uniform platform for discussion. While there are many conflicting reports on learning styles, the focus of this study is to utilize the term learning style as a mode of information processing which consists of preferred routines for learning (Entwistle, 1988; Ramsden, 1988).

Learning styles from an information processing perspective entail a cognitive model whereby the framework includes three main concepts: 1) information processing, 2) instructional preference and 3) learning strategies (Cassidy, 2004). Information processing theorists state that core assumptions about learning are critical for understanding knowledge integration to move the concepts to longer retention and application (Schunk, 2000). Therefore, deliberate planning and structuring of the learning environment with social interactions, multimodal input, active engagement in classroom activities and guided inquiry are essential activities that promote deeper learning (Schunk, 2000). Higher level questioning offers opportunities for learners to utilize critical thinking and deeper thought processes beyond rote memorization and recall of facts and concepts. National Survey of Student Engagement (NSSE, 2012) data indicated that learning activities that required students to construct, transform and apply knowledge facilitated deeper learning that yielded students' scores indicating higher achievement. Higher level cognitive skills are prerequisites for today's healthcare environment (Galloway, 2009).

Kolb (1984) describes these learning style preferences as a process with four learning preferences (concrete experience, reflective observation, abstract conceptualization and active experimentation) that are individualistic in nature depending on how learners enter the learning cycle and how they interact with the learning experience. It is this learning style preference for one of these four learning styles over a contrasting style that yields a learning style preference (Assimilator, Diverger, Converger, and Accommodator) as measured by the Kolb's Learning Style Inventory. The four preferred learning styles are described by Kolb & Fry (1975) as: **Converger,** which has high scores in Abstract Conceptualization and Active Experimentation and displays tendencies for strong skills in the practical application of ideas, hypothetical-deductive reasoning on specific problems and preferences to deal with things rather than people. The **Diverger** has high scores in Concrete Experience and Reflective Observation with characteristics for imaginative ability, generating ideas and seeing things from different perspectives. The **Assimilator** scores higher in Abstract Conceptualization and Reflective Observation with strong abilities to create theoretical models, excel in inductive reasoning, and prefer abstract concepts rather than people. The **Accommodator** displays high scores in Concrete Experience and Active Experimentation. The Accommodators are often risk takers, adapting to circumstances, solve problems intuitively and rely on others for information.

Taxonomies

The learning styles capture the learners' preferred mode of information processing however; their academic performance is measured through objectives. These objectives or constructs are established in taxonomy levels based on the intellectual behavior or mental activity needed to formulate an answer or response (Morgan &

Schreiber, 1969). In general education, one of the most widely used and influential hierarchy of question taxonomies is: Aschner and Gallagher's Taxonomy (1963). Aschner and Gallagher's (1963) Taxonomy includes four taxonomy categories from the lowest cognitive demand to the highest: cognitive memory, convergent, divergent and evaluation. Aschner and Gallagher's Taxonomy has been described as a definitive method for classifying questions in all types of course content areas (Martin, Sexton, Franklin & Gerlovich, 2005). Creating significant learning experiences requires teachers to plan the classroom learning activities that will engage the students in higher cognitive processing demands. This planning includes teachers' reflection about their classroom questioning taxonomy levels and the level of mental processing or learning approaches required for the students (Fink, 2013).

Learning Approaches

The levels of learning, from the learners' perspective, are described as surface, meso (intermediate) and deep learning (Weigel, 2002; & Marton & Saljo, 1976) The surface learner generally focuses on finding out what the teacher wants (Atherton, 2013). Entwistle, (1988) differentiated between the levels of learning or processing based on the cognitive dimension of handling information. Surface processors or learners repeat the facts without adding new elements to the content. The surface learning approach also focuses on reproducing the content and accepting ideas and information passively, as well as proposing solutions without prioritizing. Marton and Saljo (1976) include an additional middle level of approach to learning. Identified as meso or intermediate, this approach is described as the learner approaching the content by focusing on understanding the message and looking for relationships. The learner goes beyond reading the text but does not focus on extracting meaning, evidence or the logic of the argument. Deeper processing or learning represents the learner creating new information from the content given in order to interpret, propose or judge. The deeper learners propose one or more solutions in terms of judgment and are able to indicate advantages and disadvantages for a situation or solution. It is important to note that these terms are not attributes of learners as their approach can and does vary at different times.

Classroom Questioning

While teachers have different approaches to their roles, whether it is teacher or student centered; questioning is one of the most regularly utilized pedagogical strategies used in the classroom to promote learning. Most teachers are aware that verbal questioning can promote student learning at complex levels, transactional dialogue between students and teacher to empower meaning making, connect the knowledge to prior knowledge and as an assessment of student understanding (Wilen, 2004; Wilen, 2001; Good & Brophy, 2000). Research on teacher behavior in the classroom

has been correlated to student achievement (Blackburn, & Williamson, 2013; Creemers, 1994; Tobin & Fraser, 1991). Teachers identified as effective utilize high frequencies of high level taxonomy questioning to motivate students and assess for understanding (Blackburn, & Williamson, 2013; Creemers, 1994; Wragg & Brown, 1993; Tobin & Fraser, 1991).

Several studies investigated teachers' questioning patterns and noted frequencies of low-level taxonomy levels 50%- 60% of the time (Dantonio, 1990; Anderson & Burns, 1989; Cotton, 1988). While most of the questioning research studies have addressed secondary education, Barnes (1983) found similar patterns in collegiate teaching. These questioning patterns noted were 50%-80% of the time the lowest level taxonomy levels that were utilized regardless of the type of college or discipline. Deep learning is cultivated by effective questioning since it promotes thinking (Yopp, 1988). When teachers ask high-level questions of the students this elicits a significant empowerment opportunity so that development occurs and independent learners are able to regulate and direct their learning (Dillon, 1988 & Wong, 1985).

Methods

Research Design

This study investigated the correlation between the preferred learning styles for occupational therapy college or university faculty members with their taxonomy levels of questions. Eight occupational therapy faculties at two state supported institutions in a southeastern state were the subjects of this investigation. Written consent for participation was obtained from all faculty participants. Faculty completed the Kolb's Learning Style Inventory and were videotaped during a one-hour class during the fall 2012 semester. The primary researcher coded the questions utilizing the master reference chart with descriptors into the Aschner and Gallagher's Taxonomy.

Participants and Setting

The population used in this study was a purposive sample of occupational therapy faculty from a state supported university and a state supported community college. The unit of analysis was the occupational therapy faculty. The rationale of this unit of analysis was to have generalization to occupational therapy faculty. In this study, there were eight total participants. Five of the participants were full-time faculty and one adjunct faculty for the Master's program at the state supported university. This sample also included two full-time faculty in a state supported occupational therapy assistant program. All of the participants in this sample were females, which is representative of a primarily female dominant field.

Instruments and Procedures

The Learning Style Inventory (LSI) and Aschner and Gallagher's Taxonomy were the two quantitative measures utilized for this study. The Kolb's Learning Style Inventory (LSI) is a 12 item Likert scale questionnaire which the participants rank learning preferences that are the most like themselves to least like themselves. Kolb's Experiential Learning Theory is frequently utilized in health care professions (Katz & Heimann, 1991). LSI is a commonly used learning style inventory in health care (De Bello, 1990). The Participants completed the LSI and were videotaped for a one hour lecture of their choice. The Questions were recorded and classified for thirty minute and one hour increments into the Ashner and Gallagher's Taxonomy levels.

Results

The descriptive statistical results yielded the Kolb's Learning Style scores and categorized the participants into one of Kolb's four learning style categories. Five faculty members were categorized as Divergers. One faculty member was classified in each of the remaining learning style categories: Convergers, Assimilators and Accommodators. Participants in this sample were predominantly classified as Divergers (see Figure 1).

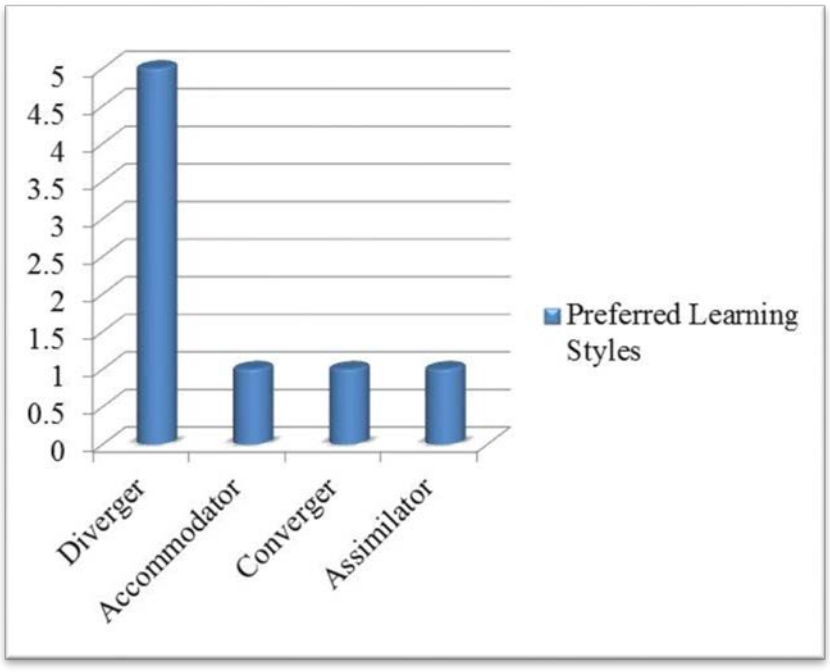

Figure 1. Kolb's Learning Style Categories for Participants

Preferred learning styles and questioning taxonomies

Pearson's moment correlational analysis was conducted with the participants' preferred learning styles with questions classified in Aschner and Gallagher's Taxonomy frequencies. The participant with the Assimilator learning style asked the most number of questions and the most questions classified in the higher level taxonomy in a 60 minutes class session. The Assimilator asked 67 divergent and five evaluation questions in a 60 minutes class session. Assimilators are categorized as being strong in deductive reasoning, theoretical models and abstract concepts (see Figure 2).

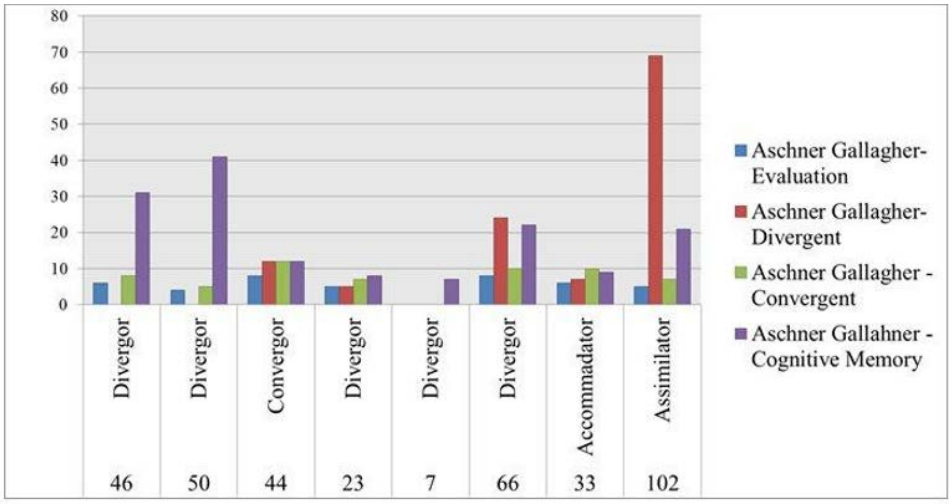

Figure 2. Distribution of Preferred Learning Style Categories and Questioning

Frequencies and Taxonomies

The Pearson's moment correlational analysis yielded relationships between the preferred learning styles and the questioning taxonomies for convergent in 30 minutes with evaluation questions in 30 minutes and divergent questions in 30 and 60 minutes (see Table 1).

Table 1

Correlation of Preferred Learning Styles and Aschner and Gallagher Taxonomy

Pearson Correlation	PLSC	CogM. 30	CogM. 60	Conv. 30	Conv. 60	Eval. 30	Eval. 60	Div. 30	Div. 60
PLSC	1								
Cog. Mem (30)		1							
Pearson Correlation	-.160								
Sig (2-tailed)	.705								
Cog. Mem (60)	.633	.336	1						
Pearson Correlation	.092	.416							
Sig (2-tailed)									
Convergent (30)	-.138	.075	-.189	1					
Pearson Correlation	.744	.860	.654						
Sig (2-tailed)									
Convergent (60)	.356	-.159	.055	.344	1				
Pearson Correlation	.387	.707	.896	.404					
Sig (2-tailed)									
Evaluation (30)	.015	.151	.256	.817*	.321	1			
Pearson Correlation	.972	.721	.541	.013	.438				
Sig (2-tailed)									
Evaluation(60)	.097	-.034	-.336	.416	.080	-.058	1		
Pearson Correlation	.819	.936	.416	.306	.850	.892			
Sig (2-tailed)									
Divergent(30)	.655	-.288	.530	.263	.260	.532	-.263	1	
Pearson Correlation	.072	.488	.177	.530	.534	.174	.530		
Sig (2-tailed)									
Divergent(60)	.837**	-.233	.665	-.041	.277	.228	-.227	.917**	1
Pearson Correlation	.00	.579	.072	.923	.506	.587	.506	.001	
Sig (2-tailed)									

Notes. ** Correlation is significant at the .01 level (2-tailed), * Correlation is significant at the .05 (2-tailed). PLSC is the Preferred Learning Style Category, the Aschner and Gallagher Taxonomy levels are denoted as: CogM is cognitive memory Conv. is Convergent, Eval. is Evaluation, Div, is Divergent for the headings at the top of the table. Cog. Mem is Cognitive Memory as noted on the left border of the table.

Limitations

Limitations to this study included data from a small sample that were not derived from the whole occupational therapy faculty population. The sample included faculty from one occupational therapy and one occupational therapy assistant program. The sample included eight subjects. The primary researcher was blind to the data and was the sole rater of the taxonomy of questions utilizing a chart with listings of the Aschner and Gallagher taxonomy levels, definitions and sample questions. This chart was also previously utilized in a pilot study to address this limitation.

Discussion

Summary

The results of the quantitative analyses for Pearson's moment correlation reflected that there was a relationship between preferred learning styles and taxonomy level of questioning. The relationship was specifically reflected between the Assimilator learning style and Aschner and Gallagher's Divergent Taxonomy level of questions. While this study had a small sample size, the findings were similar to other studies in the prevalence of lower level questioning (Cotton, 1988 & Barnes, 1983) and relationships of learning styles with questioning taxonomies (Pedrosa de Jesus, Almeida, Teixeira-Dias and Watts, 2006). The statistical effect that was noted for the Assimilator learning style was comparable to the study conducted by Pedrosa de Jesus et al. (2006). This yielded a correlation between the taxonomy of questions and the Kolb's developmental phases (acquisition, specialization and integration) and their depth of learning and understanding. The developmental phases are each associated with different taxonomy levels of questions. Acquisition questions are linked with simple thought processes that do not require evaluation, judgment or drawing conclusions. Questions in the specialization phase are linked to going beyond the search for information in order to create meaning. However, questions linked to the integration phase are linked to the learning context, reorganization of the concepts into novel patterns and application to different contexts as noted in Table 2. These similar correlations were noted with the preferred learning style (Assimilator) and the taxonomy levels of questioning. While no statistical significance was noted for the other preferred learning styles and their taxonomy levels of questioning, this difference could be attributed to the clustering effect of low level taxonomy questioning patterns that is pervasive in secondary and post-secondary education as noted in several studies (Dantonio, 1990; Anderson & Burns, 1989; Cotton, 1988 Barnes, 1983). Another consideration is that the preferred learning style, Diverger learners, which was the most common in this sample, prefers to approach learning through concrete experience and then reflect upon the learning experience which is linked with cognitive memory questions (Kolb, 1984). Therefore, there may have been some effect that was not statistically significant due to the clustering effect of low level taxonomy questions and the small sample size. For the Assimilator preferred learning style there was statistical significance for higher-level questions. The Assimilator approaches knowledge through abstract conceptualization and reflects upon the knowledge concepts (Kolb, 1984). Assimilators' preferred mode of information processing correlates with the Aschner and Gallagher Taxonomy levels of questions for Divergent and Evaluation. These taxonomy levels require the learner to use criteria to come to a conclusion and thinking to consider a wide range of responses rather than recall information in response to the teachers' questions (see Table 2).

Table 2

Integration of Kolb's Knowledge Acquisition, Learning Styles with Aschner and Gallagher's Taxonomy of Questions' Theoretical Model

Kolb's Knowledge Acquisition	Kolb's Learning Styles	Aschner and Gallagher's Taxonomy of Questions
Higher Levels of Integration		Higher Taxonomy Level Questions
Integration	**Assimilator** will ask more questions in the integration phase since this phase is characterized by integration with concepts and environment. It is theorized that divergent questions will be prevalent since this is characterized by higher level interactions with their world.	**Divergent questions** are thinking questions that stimulate learners to think independently, encourages a wide range of answers without focusing on a single correct answer. Example: if the child continues to write without therapy, how will their coordination change?
Specialization	**Converger** focuses on practical application of ideas, hypothetical and deductive reasoning on specific problems.	**Evaluation questions** facilitate learners to choose, judge, value, criticize, defend or justify responses. Evaluation questions deal with matters of value, choice and quality. Example: do you think the plot of this novel was well developed?
	Accommodator focuses on creating conceptual models are content with their interaction with the environment. It is theorized that questions will go beyond the basic facts such that they are applying the information to their world.	**Convergent questions** facilitate learners to apply and analyze information, problem solve or elicit the single best answer. Example: In your own words, according to this case how did the client get stronger?
Acquisition	**Diverger**- are concrete and focus on constructing ideas from different angles	**Cognitive Memory** questions require students to recall facts, procedures and other essential information. Example: Who invented the sewing machine?
Lower Levels of Integration		Lower Taxonomy Level Questions

Implications of Results

This pilot study yielded similar results for high frequency of low level taxonomy questioning patterns as other studies (Barnes, 1983; Cotton, 1988) and relationships between the preferred learning style and questioning (Pedrosa de Jesus et al., 2006). The implications of these results reflect similar patterns occurring and further investigation is needed to investigate the relationships in other samples. It is also important for

faculty members to reflect on their questioning patterns and engage in reflection of pedagogical strategies to implement higher level of questioning taxonomies to promote deeper student centered learning. Utilizing staff development opportunities and various questioning tools may facilitate growth in this area.

Recommendations

Replicating this research with larger samples at multiple sites and in other disciplines would enhance the generalizability of the theoretical premise of this study. Professional development workshops to provide strategies and tools for utilizing higher level taxonomy questioning in classrooms would be beneficial to promote effective questioning for deeper learning given that several studies note higher frequencies of low level taxonomy classroom questioning patterns. Participation in videotaping and analysis of one's questioning patterns would aid in recognition of frequencies and possible strategies to address the taxonomy levels. Faculty could utilize think and link strategies to assess the rationale for their types of taxonomy level questions that they asked and how these might be modified.

Implementation

Instructional methods that promote synthesis, analysis and evaluation amongst the students facilitate critical thinking that is needed for health care practice (Darnton, Lucas & Pearson, 2007). Implementation of reflection on one's teaching and questioning patterns is prerequisite to promote effective questioning and pedagogy. It would behoove us as a profession to further investigate and develop the pedagogy and curriculum that creates higher level learning. While this study has direct application to education and the occupational therapy profession at large; the generalizations are not conclusive and further investigation is warranted. It would be optimal if faculty members consider one's questioning and preferred information processing when designing the syllabus, learning scenarios, assignments and discussion. The ultimate educational goal is to promote effective questioning strategies and deeper learning.

Conclusions

While the low level taxonomy questioning patterns were anticipated due to the pervasive patterns noted in previous studies it continues to be unclear what the various contributing factors are. However, since there continues to be limited understanding of what contributors or relationships exists to these patterns and what can be done to facilitate change; further investigation is warranted. Ultimately learning is best achieved by engaging students with facilitation at a high level. Effective teaching is essential for deeper learning and has been well documented (Bain, 2004 & Yopp, 1988). While demands for teachers continue to increase; the need for effective teaching is paramount and strategies for effective questioning are a priority.

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