The Thinking Styles of a Group of Information Systems and Technology Students

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Abstract

This research reported in this contribution identifies the thinking styles of second year students in Information Systems and Technology on the Westville Campus of the University of KwaZulu-Natal, situated in Durban, South Africa. The article explores whether there is a relationship between student thinking styles and their examination marks. The subjects were 134 second year IS&T students. Harrison & Bramson (1984) identified five primary thinking styles, the Analyst, Synthesist, Pragmatist, and Realist styles. Most of the findings in this study support those of Harrison & Bramson (1984). Implications of these findings for both teaching and research are discussed.

Keywords

Thinking styles, multiple styles of thinking, IT students, InQ, IT educators, IT professionals

Introduction

IT expenditures and organisational performance have been disconnected in the past, due to an economic transition from an era of competitive advantage on information to one, based on knowledge creation. The earlier era was characterized by slow change that could not be interpreted by most formal information systems (Lubbe, 1997). During this period, information systems were based on programmable recipes for success that were able to deliver their promises of effi-

ciency, based on beliefs about particular business contexts (Lundin *et al.*, 2002).

IT managers therefore need to develop a greater appreciation for their intangible human assets (e.g. knowledge and inquiring styles). In other words, an investigation into knowledge creation needs to be done more than knowledge management (Lundin *et al.*, 2002). According to them, attention should be paid to the human aspects of knowledge creation in current formulations of IT enabled knowledge management.

This research report will therefore provide guidelines in overcoming these challenges. It will be structured and supplemented in such a way that it can be used by students and professionals, marketers and IT personnel. Hence the population for this study will be people in the Information Systems and Technology discipline, which include a normal distribution of all Information Systems and Technology students. The students' thinking styles will be matched with their final examination marks.

Characteristics of the Five Inquiring Systems

The Five Thinking Styles

Harrison & Bramson (1984) state that the technical name for Styles of Thinking is Inquiring Modes. Inquiring Modes are basic sets of purposive methods for making sense of the world. They are built on early-acquired preferences, on learned values and on concepts about the world and the nature of reality.

Harrison & Bramson (1984) conclude that in Western society there are five distinct styles of thinking. Most people showed a preference for one or two of the styles. Consequently they devised a test called the "InQ" which can be used to rate preferences for the different thinking styles. People are subcategorized as being the Synthesist, an Idealist, a Pragmatist, an Analyst or a Realist.

Taking Harrison & Bramson (1984) as a point of departure, this study will report the results by comparing it to the results reported in Harrison & Bramson (1984). The reason for using this study was because the ideas in this book are based on years of research into people's thinking patterns. Thinking about thinking will improve an individual's ability to communicate and improve their skills as IT students and professionals.

Kienholz (1999) argues that one effective means by which to leverage knowledge is for those involved to be or to become mindful of the various ways people actually go about gathering data, asking questions, solving problems and making decisions. This is where Harrison & Bramson's Inquiring Mode Questionnaire (InQ) and their related education materials could help, through their application in developing the ability to use each of these inquiring modes appropriately and in working more effectively with each other (Kienholz, 1999).

The Synthesist: According to Harrison & Bramson (1984), to "synthesize" means, essentially, to make something new and original out of things that by themselves seems different from each other. Hence, they noted that Synthesists are integrators; they like to discover two or more things that no other people may appear to have little of or no relationship at all and find ways to fit them into a new, creative combination. Facts to them are not as important as the interference the people make from them. They also found that Synthesists tend to be interested in conflict and also like change – often for their own sake. Synthesists tend to pride themselves on their "creativity," incisiveness and often secretively on their cleverness (Harrison & Bramson, 1984: 11).

The Idealist: Harrison & Bramson (1984) state that the idealist mode of thinking is used by people who like to take a broad view of things and tend to be future-oriented. They also think about goals and are interested in social values. Idealists are like *Synthesists* in their focus on values rather than facts. Idealists like to be seen by other people as useful, supportive, open and trustworthy. They tend to have strong

ethical sense and pride themselves on their high standards, though they are not always aware of just how high their standards are. They can become angry at and resentful of those who seem to care little for others, who lack integrity or who will settle for less than the best. The thought process of *Idealists* is receptive, that is, they welcome a diversity of views. When it comes to solving problems, *Idealists* are at their best in situations where the important things are values, judgment, feeling and emotions. Idealists especially pride themselves on their "intuition" (Harrison & Bramson, 1984:12).

The Pragmatist: The motto of the Pragmatist is "Whatever works." They excel at finding new ways of doing things with the materials that lie at hand. They tend to approach problems in a piecemeal, incremental fashion, one thing at a time. Pragmatists tend to be less predictable than people who prefer other styles of thinking. Facts and values have equal weight for them. Again, "whatever works" is what is important. They are also apt to be interested in formulating strategies and tactics for getting things done and they often like to be liked, approved of, or at least accepted. The pragmatist approach is flexible and adaptive. They also take pride in their adaptability (Harrison & Bramson, 1984:13).

The Analyst: The Analyst approaches problems in a careful, logical, methodical way, paying great attention to details. Analysts see themselves as factual, down-to-earth, practical people. They also tend to have a theory about almost everything. They analyze and judge things within a broad framework that will help to explain things and arrive at conclusions. Analysts see the world as logical, rational, ordered and predictable. More than anything else, *Analysts* want to be sure of things, to know what's going to happen next. They take pride in their competence, in the sense of understanding all the facets of whatever the situation in which they happen to be (Harrison & Bramson, 1984:15).

The Realist: The Realists motto is, "facts are facts." Or maybe, "What you see is what you get." Realists firmly believe that any two

intelligent people, properly equipped with eyes and other sense organs, will at once agree on the facts. Without agreement on the fact, *Realist* believes, things don't get done. They also want to do things surely, soundly and firmly and to be assured that once something is done it will stay that way. The Realist always wants to get things done by proceeding on the facts that are at hand, rather than by gathering ever more data as Analysts do (Harrison & Bramson, 1984: 17).

Combined Thinking Styles

According to Harrison & Bramson (1984), no individual thinks with purely one style. Most people show preferences for a single style and some show equal preference for two styles. It is those latter people with which this section deals.

Idealist-Analyst (I-A): The I-A is characterized by a broad, comprehensive view. They are careful, thoughtful people who want to achieve the ideal goal using the best method possible. They are unlikely to make quick decisions and possess a future-oriented, planned view of things (Harrison & Bramson, 1984).

Analyst-Realist (A-R): The A-R person is highly task-oriented and objective. They like facts and structured approaches to problems. They are interested in achieving concrete results and finding the best methods for achieving them. The A-R does not like situations that defy analysis and when confronted with such a situation they tend to freeze or be unable to cope (Harrison & Bramson, 1984).

Synthesist-Idealist (S-I): The S-I thinking style is in many ways the exact opposite of the A-R. The S-I will tend to focus on ideas and inferences rather than structure and facts. They are perceived as being conceptualizes and theorists by other individuals and therefore not very practical (Harrison & Bramson, 1984).

Idealist-Realist (I-R): The I-R is characterized by the twin thrust of high standards and concreteness. They know how things should be done and also have the skillset to carry them out. They don't seek a lot of recognition for their efforts (Harrison & Bramson, 1984).

Pragmatist-Realist (P-R): The P-R is highly task oriented but approaches things in a less structured manner than the A-R. They tend to have considerable energy and drive and achieve things solely for the sake of achievement. They tend to make quick decisions with a minimal amount of data and as a result can quickly become overextended and may seem impulsive (Harrison & Bramson, 1984).

Idealist-Pragmatist (I-P): The I-P combination is typical of someone who gains agreement on goals and then tolerates a great deal of latitude in method. They have a great concern for "people" issues and more in tune with a person's needs. As a leader, the I-P will appear to be over permissive and be allowing of too much latitude (Harrison & Bramson, 1984).

Analyst-Pragmatist (A-P): The A-P likes facts and structure but also is willing to experiment. They know what they want and how to get there but want to have fun along the way. This can be quite damaging in relationships due to the fact that serious goals and directions will appear to be not taken seriously by the A-P (Harrison & Bramson, 1984).

Analyst-Synthesist (A-S): The A-S respects structure and logic. The Analyst style seems to be more dominant in this combination most of the time. Whereas the Analyst respects structure and logic, the Synthesist understands and values the opposite. This can be the source of great internal conflict and a profound lack of understanding by people around them. They can, sometimes be very difficult to listen to but have a lot to contribute (Harrison & Bramson, 1984).

Synthesist-Pragmatist (S-P): S-P's show the greatest tolerance for change. They strive on ambiguity and uncertainty and have developed the coping mechanisms to deal with both. Their thinking style generates tremendous amount of creativity (Harrison & Bramson, 1984).

Synthesist-Realist (S-R): The S-R is extremely rare due to the fact that the synthesist and realist are at the opposite ends of the think-

ing spectrum. The S-R is a person with great energy for unorthodox but firm achievement. They can see very clearly what the proper course is and also see that the opposite way is just as acceptable (Harrison & Bramson, 1984).

Three Way Thinkers: People that possess a strong preference for three of the five styles tend to be more creative. This flows from the idea that they have more thinking styles available to them. They are more versatile and can rely on the style that best suits an individual situation (Harrison & Bramson, 1984).

Flat Profile Thinkers: The rarest of thinking style preferences is a person who shows no preference for any specific style. This is where the InQ test shows a relatively equal score for all five thinking styles. These people tend to be unpredictable, less intense and less recognizable than people with strong preference for other styles. They tend to be very adaptable to a situation but also tend not to be leaders (Harrison & Bramson, 1984).

Available Statistics on the Inquiring Mode Questionnaire

According to Harrison & Bramson (1984), the most productive thinkers may simply be those who are capable of thinking well in all five dimensions. He further stated that the Synthesist and Idealist styles are strongly oriented toward the "value" side of the dichotomy or substantive rationality while the Analyst and Realist approaches are clearly more oriented toward "facts" or formal, functional rationality. The Pragmatist, contingent approach either bridges the gap between the two or perhaps ignores the question altogether.

Kienholz (1999) states that the Synthesist and Idealist inquiring modes are substantive, value-oriented ways of thinking and knowing, while the Analyst and Realist are functional and fact oriented. He then went on to state that about half of all people prefer to think in one main way, 35% prefer two or more styles in combination.

Kienholz (2000) finds that a solid understanding and appreciation of the different preferences that people hold for each of the thinking styles can lead to an improvement in the design of information and knowledge management systems.

DeLisi (1998) establishes that the results of his research indicated that IT professionals are less likely than expected to employ an analytic thinking style and more likely to employ an idealist or pragmatist style.

Perpetuation of the stereotype as stated by DeLisi (1998), impacts on the role of IT professionals in the organisation in three ways:

- It limits their opportunities for job assignments that have strategic impact on the organisation,
- It limits their opportunities for promotion to the highest levels of the organisation,
- It affects their relationships with clients and senior executives.

These limits in turn affect the success of IT overall. Before DeLisi (1998) administered the InQ questionnaire, the participants were asked which thinking style they believe will be most common among the sample group. Almost universally, they stated that the analyst style will be most prevalent. This will tend to have a self-fulfilling effect; with IT professionals more likely to volunteer for activities that are detailed and analytical in nature rather than volunteer for leadership positions that require a skill they do not perceive that they have. If the contributions of these IT professionals are predominantly of an analytic nature that reinforces the stereotype and makes it less likely they will be involved in tasks that are truly significant to the enterprise. Hence this study by DeLisi (1998), which deduces that a large percentage of IT professionals tend to have idealist characteristics.

Zhang (2002) states that the styles of thinking contribute to IT students' academic achievement beyond what can be explained by abilities. He also found that teachers could foster students' creativity by using the thinking styles. The understanding of how students think can help teachers in using different instructional styles and different assessment schema to foster creativity by accommodating to and challenging the development of multiple thinking styles.

The Impact of Thinking Styles on IT Students

According to Zhang (2001), there are many reasons why some students get distinctions in their courses because there are various ways of explaining individual differences in academic achievement. He further stated that traditionally, many psychologists and IT educators have attributed IT students' successes and failures in academic achievement mainly to individual differences in abilities, but in recent times, scholars have been examining other factors that affect students' learning outcomes. This could in a way be interpreted as IT students whose individual differences affect their academic successes and failures.

Zhang (2001) believes that the different thinking styles do more than just facilitate IT students' intellectual development. Thinking Style also help enhance IT student development in interpersonal relationships. As a result, IT students will learn how to work and deal with their peers. He also found that the thinking styles were related to IT academic achievement and had implications for teacher training. He suggested that all teacher-training programs include a component that introduces knowledge on thinking styles. Hence, he deduced that an understanding of thinking styles could improve IT educators' teaching and thus, student learning.

Zhang (2001) finds that the styles of thinking contributed to IT students' academic achievement. He found from previous studies that certain thinking styles statistically contributed to the prediction of academic performance beyond ability tests and it also suggested that stu-

dents with particular thinking styles did better on some forms of evaluation than on others. Lin and Liu (2003) further states that the thinking styles could assist IT educators in identifying individual differences among students and help them to consider students' needs in a more individual base.

Zhang (2002) identifies a variety of methods for inducing the use of the thinking styles. One of his methods was that educators should start giving consideration to the fact that repeated studies have found that both school and university curricula around the world tend to penalize creative thinking. He further stated that in order to produce IT students who are going to be capable of adapting themselves to the ever-changing world, educators must start cultivating students' creative thinking during their educational career. Otherwise, the current generation of students' will be overwhelmed by their future world of work.

Zhang (2002) also finds that IT educators who work in an environment, which they are given flexibility and autonomy, would work in an innovative manner. Thus, IT educators could become role models for IT students in using thinking styles.

Bernardo *et al.* (2002) states that there could be some differences that may be observed between correlation patterns because of the different cultures in the education systems. According to Stuhlman (2004), culture is a combination of organisational history, shared experience, group expectations, unwritten or tacit rules, ethics and social interactions that affect the behaviour of everyone in the organisation. Bernardo *et al.* (2002) further states that formal educational institutions tend to promote knowledge and skill that are valued by the larger culture or society within which they operate. Accordingly, educational systems in different cultures might also value and encourage different thinking. This may reflect cultural preference for thinking styles. By recognizing such differences in how educational institutions value some thinking styles over others, researchers can better understand how it affects performance in the different cultures.

Research Methodology

Aim of the Research

Khumalo (2002) states that well-defined aims sets in place all other things such as the selection of the most appropriate methods and the management of the research once it has been started. The aim of this research was to determine the thinking styles of IT students in relation to the marks they obtain.

Measuring Instrument

The authors decided to use a Questionnaire as an elicitation instrument to obtain the data. Remenyi *et al.* (2000) states that the main purpose of questionnaire research is to obtain information that cannot be easily observed or that is not already available in written or computerized form. The purpose for using a questionnaire in this research is because the information cannot be easily observed. The author cannot determine an individual's thinking style without the use of a questionnaire as other forms of measurements may make individuals feel uncomfortable and withdrawn. This can generate mixed responses and may not be a true reflection of how the individual thinks.

The Inquiring Mode Questionnaire (InQ) as designed by Harrison & Bramson (1984) was used for this study. According to DeLisi (1998), the InQ instrument is one of a number of instruments (e.g. Sternberg & Wagner (1993) - Thinking Styles Questionnaire and Grigorenko & Sternberg (1993) - Thinking styles questionnaires for teachers and students) that measure individual thinking styles and related variables but it differs from other instruments in that it looks at how people process information – something to which IT students can easily relate and it stays away from personality measurements, such as introversion or extraversion, thereby avoiding the defensiveness that might result from a discussion of one's personality.

Sample Design

Population refers to the entire group of people, events or things of interest that the researcher wishes to investigate (Sekaran, 2000). The Population for this study consisted of people in the Information Systems and Technology discipline, which included a normal distribution of all second year Information Systems and Technology students.

This study was conducted in School of Information Systems and Technology on the Westville Campus of the University of KwaZulu-Natal. The sample for this study included all second year IS&T students.

Sampling Technique

The samples for the IT students and academics were selected using the simple random sampling technique. According to Sekaran (2000) this technique is where every element in the population has a known chance of being chosen as subjects in a sample. The procedure used for selecting a sample of IT second year students included entering the names of the students into Microsoft Excel and thereby selecting a sample of 144 students from a population of 230 students (as per table for determining sample size from a given population from Sekaran (2002)), by randomly generating numbers statistically.

Data Collection Method

The questionnaire that is used in this study is similar to the one used by Kienholz (2000), in the study entitled "Metaknowledge Management: Global Implications of Churchman's Inquiring Systems for Knowledge Creation and Sharing". The questionnaire was personally administered to the respondents because according to Sekaran (2002) this type of data collection method is less time consuming and less expensive.

This method is most appropriate because if respondents have any doubts on the questions, it can be clarified immediately. As compared

to mail questionnaires, this method has a higher response rate. The use of interviewing as a means of collecting data is also not appropriate in this research as it may intimidate respondents into not expressing their true answers to the questions (Sekaran, 2002).

The thinking styles of the before mentioned Information Systems and Technology students was measured using the InQ questionnaire and these scores were then used to determine their thinking style. Once their thinking styles were established, all students with the same thinking style were grouped together and a correlation was established between their ranges of their examination marks and their style of thinking. Students were then asked to provide their gender, age and registration number on the demographic sheet, which was provided. Their examination marks were then verified.

Results and Discussion

A total of 144 questionnaires were given to the second year students and 134 responses were received back for analysis. According to Kienholz (2000) preference for a mode(s) is indicated by a score of 60 or more. Profiles are explained in terms of one-way thinkers, two-way thinkers, three-way thinkers and level profiles. Results for the group of 134 are as follows:

- One-way thinkers = 122 or 91% of the students. (Seven were Synthesists, thirty-seven were Idealists, twelve were Pragmatists, sixty-two were Analysts and four were Realists)
- Two-way thinkers = 11 or 8% of the students. (One was Idealist and Pragmatist, one was Analyst and Synthesist, two were Analyst and Realist, four were Analyst and Pragmatist and three were Idealist and Analyst)
- Three-way thinkers = 1 person had a preference for Pragmatist, Analyst and realist styles of thinking.
- There were no students who preferred level profile thinking, that is, students who preferred four or five styles of thinking.

- All students in the sample were aged between 19 and 28 years old. 35% of the sample was male while the rest were female. The questionnaire usually takes about 30 minutes to complete, but there were some students who took less than 30 minutes. The following table gives an indication of the mean differences as well as the percentage of students who scored 60 or more.

	Synthesist	Idealist	Pragmatist	Analyst	Realist
Range Differences	(57-66)	(56-75)	(58-67)	(59-73)	(61-63)
	9	19	9	14	2
Group Means (N=134)	60.57	63.92	63.08	65.60	61.50
% of participants scoring 60 or above in each inquiry mode:	4	24	8	45	3

Table 1: Respondents' self-reported thinking styles

There were no participants who scored 48 or less in each inquiry mode. As demonstrated in Table 1, the range differences are very close. The author therefore concluded that the students preferred the analyst style of thinking, since 45% of the students had a score of 60 or above in this style of thinking. The range difference also indicates that the scores for each respondent in each style of thinking was quite close

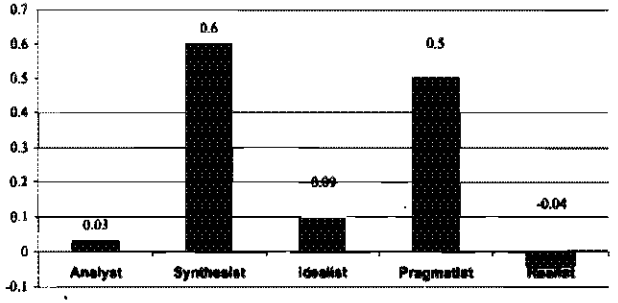

Figure 1: Correlation between students' Examination marks and their Style of Thinking

Figure 1 depicts the correlation between the student's examination mark and their style of thinking. Four of the styles of thinking show a positive relationship between the style of thinking and the student's examination mark. The strongest relationships exist between the Synthesist and Pragmatist styles of thinking and their relevant examination marks. The reason for the Synthesist having the strongest relationship is because they have a tendency to look at a problem from many different perspectives and can usually come up with some pretty creative solutions because they enjoy conflict or being asked to come up with solutions to the "unsolvable problem". The Pragmatist is like the Synthesist that is why their correlations are so close; they are resourceful and creative individuals that are problem solvers and creators of solutions. Their solutions tend to be a bit more risky than those of the Synthesist but are more innovative with a better payoff and therefore support the findings by Harrison & Bramson (1984).

The Idealist on the other hand, has a low correlation because they delay from too many choices and try too hard for perfect solutions. They can also appear overly sentimental (Harrison & Bramson, 1984). The analyst also produced a low correlation as they tend to over analyze and over plan. They can also be overly cautious and try too hard for predictability (Harrison & Bramson, 1984). Therefore these findings support the findings by Harrison & Bramson (1984).

Realist produced a negative correlation because they rush to over-simplified solutions and try too hard for consensus (Harrison & Bramson, 1984).

The correlation between the examination marks and the one-way thinker's displayed a low positive relationship of 0.18, while the two-way thinkers had no correlation between their examination marks and both their styles of thinking. The individual who had a three-way thinking style had a C examination score. This shows that a combination of thinkers might not be able to solve a problem cooperatively and will affect systems building.

Recommendations and Conclusions

The author recommends that IT educators should take note of Zhang (2002) three ways in which IT educators can modify IT students' thinking styles. This can help increase students' academic achievement. They are as follows:

- Firstly, IT educators could re-examine and redesign their instructional models. The new instructional models should be such that they allow multiple thinking styles and that they put together the specialized functions of both the modes of thinking. By making allowance for the different thinking styles, the IT educator is giving IT students an equal opportunity to benefit from their instructions and to experience IT academic success, no matter what the students' predominant thinking styles are.
- Secondly, IT educators could also encourage the use of thinking styles by providing IT students with opportunities for participating in extracurricular activities. This will lead to creativity-generated thinking styles and advanced cognitive development.
- Thirdly, there is also an indirect way of allowing IT students to use multiple thinking styles and to be engaged in both modes of thinking. That is, IT educators themselves should be al-

lowed to use creativity-generated thinking styles in their teaching and interaction with students in general.

As can be seen from this research, IT students need to understand their thinking styles in order to be successful. The authors would like to recommend that the same study be done on the first and third year students in order to gain a better understanding of IT students' thinking styles.

References

Bernardo, ABI, L Zhang & CM Callueng 2002. Thinking Styles and Academic Achievement among Filipino Students, *The Journal of Genetic Psychology*, Vol. 163, No. 2, pp. 149-163.

Delisi, PS, RL Danielson & BZ Posner 1998. A CEO's-Eye View of the IT Function, *Business Horizons*, Vol. 41, No. 1, pp. 65-74.

Harrison AF & RM Bramson 1982. *The Art of Thinking*. Berkley, New Jersey.

Khumalo, R 2002. The Importance of Research Methodology in a Publishable Research Paper, *European Conference on Research Methodology for Business and Management Studies*, United Kingdom, April, pp. 173-176.

Kienholz, A 2000. Metaknowledge Management: Global Implications of Churchman's Inquiring Systems for Knowledge Creation and Sharing, *Workings Paper*.

Kienholz, A 1999. Systems ReThinking: An Inquiring Systems Approach to the Art and Practice of the Learning Organisation *Foundations of Information Systems: Toward a Philosophy of Information Technology* http://www.cba.uh.edu/~parks/fis/fisart.htm accessed 1 Sept 2004

Lin, SSJ & EZF Liu 2003. Effectively Accumulating Students' Thinking Styles via the World Wide Web: Experiences of Construction and Application, *International Journal of Instructional Media*, Vol. 30, No. 1, pp. 61-65.

Lubbe, S 1996. *The Assessment of the Effectiveness of IT Investments in South African Organisations*. PhD Thesis in Information Systems & Technology, University of the Witwatersrand.

Lundin, MS, H Herlau & LB Rasmussen 2002. Paradoxes in IT, Education and Citizenship, *Second European Conference on Information Technology* (Education and Citizenship) Barcelona, June.

Remenyi D, B Williams, A Money & E Swartz 2000. *Doing Research in Business and Management–An Introduction to Process and Method*, Great Britain: The Cromwell Press Ltd.

Sekaran, U 2000. *Research Methods for Business – A skill-Building Approach*, New York: John Wiley and Sons Inc.

Stuhlman, D 2004. Important Terms for Knowledge Management, *Stuhlaman Management Consultants* http://home.earthlink.net/~ddstuhlman/defin1.htm accessed 1 Sept 2004.

Zhang, L 2001. Do Thinking Styles Contribute to Academic Achievement beyond Self-Rated Abilities? *The Journal of Psychology*, Vol. 135, No. 6, pp. 621-637.

Zhang, L 2002. Thinking Styles: Their Relationships with Modes of Thinking and Academic Performance, *Educational Psychology*, Vol. 22, No. 3, pp. 331-348.

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