Abstract

The main goal of the present research study addressed the comparison of two normative models of decision making (Kaniel, 2003; Zakai, 1998). In these two models, it is possible to identify similar themes in principle: in the fundamental assumptions, in the definition of decision making, and in the process they shape.

In the two models, there are several similar fundamental assumptions. (1) The integration of analytical methods in the decision making process can considerably improve the quality of the decision made at the end of the process. (2) The decision making process constitutes a logical supra-strategy with a broad range of transference. (3) The stages in the process are structural and logical and determine 'how' to decide and not 'what' to decide and therefore they are applicable in a broad range of situations. (4) According to the two models, it is possible to define decision making as a conscious action of choice made after a cognitive process with many stages and components, which is motivated using meta-cognitive supra-processes, through which the decision maker manages himself in the process. (5) The two models indicate a two-layered process of decision making: cognitive and meta-cognitive, circular and not hierarchical, in which a repetition of pervious steps following self-examination is possible.

However, there are important differences between the models. (1) Although in the cognitive dimension of both models there are identical stages, the cognitive dimension of the Multi-stage model (Zakai, 1998) lists a greater number of stages in comparison to the number of stages of the Meta-cognitive model (Kaniel, 2003).

(2) The names of the stages of the Multi-stage model are less known and less clear than are those of the Meta-cognitive model. (3) In the Multi-stage model (Zakai, 1998), the reference to the meta-cognitive dimension is implied by the explanations of the different stages. These explanations detail the meta-cognitive actions that occur in the decision making but are not included and named in these supra-systems. In contrast, the Meta-cognitive model (Kaniel, 2003) proposes a focused and detailed reference to the higher thinking processes that occur before, during, and after the basic cognitive process.

The differences indicate that the Meta-cognitive model (Kaniel, 2003) is more limited and clearer in the cognitive dimension and achieves a higher level of detail and conceptualization of the meta-cognitive elements of the decision making process.

To compare between the models, the research study implemented an intervention program, during which sixty teachers, who were divided into two groups, learned the decision making process of one of the two models (Kaniel, 2003 or Zakai, 1998). Before the learning, the research participants' level of performance of the decision making process, the quality of their decisions, and their degree of satisfaction from these were examined. The models were learned and practiced during group sessions in the teaching/learning framework, the goal of which is to achieve the transfer of the decision making process, while inviting new situations for decision making and engagement in the creation of conscious abstraction of contents and their organization in a structure that includes principles, strategies, and relations (Kaniel, 2001).

After the learning, the research participants were asked to make decisions on events in different areas: education, everyday life and detection. These events were chosen since they necessitate different ranges of transfer of the learned process (close transfer and distant transfer).

Then, the performances of the two research groups were compared regarding four criteria: (1) **Ease of acquisition of the model** – as expressed in the level of performance of the decision making process. (2) **Ease of transfer of the model** - as expressed in the level of performance of the process as it was transferred for the purpose of making decision in different areas. (3) **Quality of the decisions obtained with the help of the model** – in this area in which the model was learned and in different areas. (4) **Degree of satisfaction** – from the process and from the decisions made with its help.

Comparison of the models yielded the following findings:

In terms of the ease of the **model acquisition** – There is no preference or advantage to one of the models over the other. Learning the decision making process improved the ability to manage a complex, rational, and more considered process among the learners of both models and they performed it after the learning on the same level.

In terms of the ease of the **model transference** – The two models have good potential of transfer, but the process that the Meta-cognitive model (Kaniel, 2003) shapes is transferred better when distant transference is required.

In regards to the **quality of the decisions** – The use of the decision making processes shaped by the two models improve the quality of the decisions made using them in all the areas. In the area of everyday life and detection (areas that required distant transfer of the process), the learners of the two models made decisions of similar quality. In contrast, in the realm of education, in which the models were learned (a realm in which close transfer of the process was required), a meaningful advantage of the quality of decisions made by the learners of the Meta-cognitive model (Kaniel, 2003) was found.

In regards to the degree of **satisfaction** – The learners of both models expressed a similarly high degree of satisfaction with the processes they conducted in the different events in which they had to make decisions. In regards to the satisfaction with the decisions, the learners of the Multi-stage model (Zakai, 1998) expressed a higher degree of satisfaction with the decisions they made in the field of education in comparison with the degree of satisfaction expressed by the learners of the Meta-cognitive model (Kaniel, 2003). However, this degree of satisfaction was not supported by the quality of the decisions they made, which was significantly lower than that of the decisions made by the learners of the Meta-cognitive model.

The **conclusions that arise from the summarization of the results** are as follows:

In the theoretical aspect – The results are commensurate with the fundamental assumptions upon which the models are based. The two models improve the level of the decision making process and the quality of the decisions obtained with its help in every field. In addition, the decision making process is a supra-strategy that crosses

borders, since the model learners succeeded in transferring it to different areas and achieving with it quality decisions.

In the applied aspect – The results indicate that the **cognitive load, the reflective and meta-cognitive processes** constitute main factors in the distinction between the models.

Analysis of the findings in regards to the cognitive load clarifies the source of the advantage of the Meta-cognitive model (Kaniel, 2003). The familiar and clear concepts of the cognitive dimension of the process created by the model reduce the intrinsic cognitive load placed on the working memory **during the model acquisition** and leave greater working memory resources. These resources were used in the present research study to increase the germane cognitive load; in other words, to learn the model in an elite manner through the engagement in the organization and the generalization of the principles of the process. This learning helps the storage of the model in long term memory in such a way that makes it easier to retrieve it for the purpose of transferring it during decision making in the future. During the **performance**, in the use of the model after it has been learned, the level of organization and generalization of the process and its limited number of stages facilitate the integration of the data of the event for which it is necessary to make a decision and the stages of the process and the re-consideration of the stages and actions. They allow the release and allocation of the memory resources necessary for the information processing so as to make a more quality decision.

In addition, **analysis of the findings in regards to the reflective and meta-cognitive processes formed by the model helps clarify the sources of the advantage of the Meta-cognitive model** (Kaniel, 203). The meta-cognitive dimension of the Meta-cognitive model includes the open presentation, naming, and detailing of the reflective and meta-cognitive processes that should be conducted during decision making. When **acquiring the model** these processes contribute to the development of good understanding of the learned content and the promotion of the integration, mergence, and assimilation of the new knowledge. **During the performance**, in the use of the model for decision making, the knowledge of these processes and of the manner and timing of the use help conduct a controlled and planned process that ends in the making of quality decisions.

It can be inferred from the aforementioned statements that the most effective model of the two models is the Meta-cognitive model (Kaniel, 2003). However, it appears that it is necessary to qualify this conclusion because of the quality of the decisions made by the learners of the Multi-stage model (Zakai, 1998) in events in the realm of everyday life and detection. In these events, despite the performance of the process on a level lower than that of the learners of the Meta-cognitive model, the decisions that they made were of similar quality to the quality of the decisions made by the learners of the Meta-cognitive model. This achievement of the learners of the Multi stage model reduces the advantage of the Meta-cognitive model, since the purpose of the learning and management of the decision making process is the achievement of quality decisions in every realm. This conclusion has implications and recommendations for the improvement of the Multi-stage model (Zakai, 1998),

which will be detailed in the continuation in the recommendations for future research.

Recommendations for Future Research

Comparison of the two models after the improvement of the Multi-stage model (Zakai, 1998), through the extension of the duration of time of its learning and emphasis of the meta-cognitive processes

As aforementioned, the research findings indicate the potential of the Multi-stage model, and an attempt can be made to realize it by introducing small changes in the intervention program and improving the model. The comparison of the models of decision making in the present research was conducted after the implementation of an intervention program identical in its elements (aside from the acquired model). We concluded that the lesser intrinsic cognitive load of the Meta-cognitive model, because of the familiarity and clarity of its stages, made it easier to acquire. To attempt to reduce this difference it is recommended to **extend the duration of time dedicated to the learning of the Multi-stage model**. This extension will enable better working out of the process formed by the model and engagement in its organization and generalization so as to use it when making a future decision.

Another difference between the models compared in the present research addresses the manner of presentation of the reflective meta-cognitive processes entailed by the decision making process. While the Meta-cognitive model (Kaniel, 2003) openly presents, names, and details these processes, in the Multi-stage model these processes are implied by the explanation of the different stages. We concluded that the manner

of presentation of these processes was very important in the acquisition of the models and influence the emphases in the teaching. These were expressed later in the level of implementation of the reflective meta-cognitive processes during the use of the models for decision making. Therefore, it is recommended to emphasize these processes while teaching the Multi-stage model (Zakai, 1998) and to engage in the manner of their implementation while illustrating and conceptualizing the process.

Extension of the Generalization Ability of the Research Findings and Increase of the Depth of the Knowledge regarding Its Findings

Examination in 'real' conditions – This research study was conducted under 'laboratory' conditions, a simulation of events upon which the decisions were made. This research constellation limits the generalization ability of the conclusions. To extend this ability it is recommended to evaluate the decision making ability under real time conditions, through the documentation of the behaviors in the different living systems in which the decision are made.

Examination of personality and emotional variables – During the analysis of the findings and their interpretation, hypotheses were raised in regards to the impact of different personality and emotional variables on the way of decision making. Variables such as locus of control, sense of self-efficacy, causal attributions, and motivation should be included in the research so as to eliminate their impact and/or better explain the findings with their help.

Recommended Indices and Tools for the Comparison of Models of Decision Making

Preference of evaluation with the help of outside judges over personal report and evaluation.

According to the recommendations that arise from the research literature (Borgazcz et al., 2006), the models in this research were compared using cognitive, behavioral, and emotional indices: level of performance of the process of decisions making, quality of the decisions, and degree of satisfaction. These indices were evaluated using different instruments. Some were evaluated by external judges and some were personally evaluated by the research participants. In two of them, the self-reporting questionnaire on the decision making process and the scale of satisfaction, both of which are based on personal evaluation, problems were discovered. The research findings indicate the possibility of a ceiling effect in the self-reporting questionnaire and a gap between the self-reporting and the level of performance in actuality of the process, as evaluated by the external judges. This gap derived from the bias in the personal evaluation and it originates in the lack of awareness of the desired process and external factors (such as social desirability, expectations, norms, and social pressure). In the index of satisfaction as well problems arose, expressed in a degree of satisfaction that was not commensurate with the level of performance of the process and the quality of the decisions that were made. The degree of satisfaction was influenced by the level of awareness of the desired process and by the perceptions, attitudes, and personal beliefs that address the event for which the

decision was made. Therefore, it appears that in the examination of complex thinking abilities, such as the ability to make decisions, external evaluation with the help of external judges should be preferred to individual reporting and evaluation. In addition, to measure satisfaction we should not employ only a quantitative subjective index. It is recommended to add to this evaluation an index, the scores of which are derived using analysis of the statements that appear in the protocol and/or observations through which it will be possible to enrich the information and make it more objective. In addition, tools should be added that examine personality characteristics and attitudes, perceptions and beliefs, which will facilitate the identification and understanding of the additional factors that influence the degree of satisfaction.

Applications in Education

The engagement in teaching necessitates skills of decision making and ways of teaching the topic. In light of the research findings, it is very important to add a course on the topic of decision making to the teaching training program and to the constellation of teacher inservice training. The training of teachers in this field requires focus on two goals: (1) the cultivation of the personal ability of the teachers to make decisions and (2) the inculcation of the ability to teach this topic to the students. In addition, it is recommended to teach the topic (to teachers and students) with the implementation of the principles included in the intervention program in this research, since these made the acquisition of the complex process easier and enabled the achievement of transfer of the learned process to different areas and the making of quality decisions.

To achieve transfer of the process of decision making, it is recommended to teach a model of decision making characterized by a process that can be acquired and performed in stages, when the number of stages is as limited as possible, when the names of the stages are commonly found in the spoken language and their meaning is understood from their names. The model should openly present and detail the meta-cognitive processes entailed by the decision making and include reflective processes before, during, and after the decision making. This recommendation is applicable in regards to teaching for the transfer of all content process and for the cultivation of skills and abilities.

In addition, it is desired to base the learned practice and the examination of the transfer on 'challenging' events that will constitute a true problem, not familiar from the experience in the past, and therefore requiring the help of the new acquired process. It is recommended to teach the contents through the implementation of the following principles, which were found effective in the present research: structuring of knowledge, cooperative learning, increase of the germane cognitive load through the emphasis of high order thinking processes, and engagement in abstraction and generalization of the contents to principles, strategies, and relations, and integration of techniques for the reduction of the intrinsic and extaneous cognitive load.