**Mathematics/Computer Programming Attitude Scale for ESTRELLA Middle/High School Students**

*By*

*Carlos A. López Leiva*

This attitude scale is an adaptation of the Fennema and Sherman Mathematics Attitudes Scales (FSMAS) (1976) has been one of the most salient studies often cited and used as a basis for the development of related versions. The complete FSMAS instrument is composed of nine scales, each with 12 items. The nine scales include the Attitude towards Success in Mathematics scale; Mathematics as a Male Domain scale; Mother, Father, and Teacher scales; Confidence in Learning Mathematics scale; Mathematics Anxiety scale; Effectance Motivation in Mathematics scale; and Usefulness of Mathematics scale. This instrument has 108 items and takes 45 minutes to complete. The FSMAS have been modified for different age groups (e.g., Elliot, 1990; Sherman, 1983) and for use in different subject areas such as English, physical education, and also for populations abroad, e.g., Australia and Japan. Multiple shortened versions of the scales have also been used in order to quicken the process.

This mathematics/engineering attitude consists of twenty items that explore four attitude- related factors:

I.Confidence II.Usefulness III.Enjoyment IV.Motivation

The survey includes 20 questions. A fourth, of the total items, addresses each of the above categories. Only one item per category addresses the engineering field. This ratio was decided based on the fact that the majority of middle school students are “uncertain or not interested in engineering due to a lack of knowledge, inferior perception of science skills, or interest in a different career” (Mooney & Laubach, 2002, p. 317).

The scale was constructed using a 5-point Likert-type response format. Each item has an answer that has five fixed-multiple choices, which describe a possible level of agreement to each statement. Students would choose among the following rating agreement levels: strongly disagree, disagree, undecided, agree, and strongly agree. There have been arguments about having an even number of choices over an odd set; it is believed that students will not make a choice and would select the neutral option. However in the case of this scale, it is also the purpose to record how the students’ attitude towards mathematics/engineering changes over time; therefore, the option of being neutral at some point or always is also part of a truthful attitude.

It would take students approximately 10-15 minutes to complete the entire questionnaire.

The scale could be administered in small groups of students (2-4), and each student would respond individually. Prior to the administration of the scale, the facilitators would have a training session to go over the instructions for administration. Emphasis would be made on the paradigm “***There are no right or wrong answers****. The correct responses are those that are true* ***for you***”; on explaining statements if needed, but without hinting at answers; on scoring issues; and on how to respond to the items that describe their feelings. For this last purpose one card per administrator would be provided, each of which would contain a sample item. There is also an alternative version in Spanish.

# References:

Elliott, C. D. (1990). The nature and structure of children's abilities: Evidence from the Differential Ability Scales. *Journal of Psychoeducational Assessment*, 8, 376-390.

Fennema, E. & Sherman, J. A. (1976). Fennema-Sherman Mathematics Attitudes Scales: Instruments designed to measure attitudes toward the learning of mathematics by males and females. *Catalog of Selected Documents in Psychology*, *6*(1), 31.

Fennema, E. (1989). The study of affect and mathematics: A proposed generic model for research. In D.

B. McLeod & V. M. Adams (1988), *Affect and mathematical problem solving: A new perspective* (pp. 205—219). New York: Springer-Verlag.

Mooney, M. A. & Laubach, T. A. (2002). Adventure engineering: A design centered, Inquiry based approach to middle grade science and mathematics education. *Journal of Engineering Education,* 309-318*.*

Sherman, H. J. & Christian, M. (1999). Mathematics attitudes and global self-concept: An investigation of the relationship*. College Student Journal*, 33(1),

Instructions for administration:

* Explain that today they (students) are going to think about things that they like or dislike about mathematics and/or engineering. And that this is the reason to take the survey.
* Ask and make sure that everyone writes down her/his name and the date on the given spaces.
* Read Instructions on the page, indicating that there is no time limit and overall making emphasis on **‘no right answers.’** Then proceed to reading the directions on the scale**:**

As you read the sentence, you will know how you feel about that idea; please circle the choice that best describes how much you agree or disagree with the statement. Do not spend much time responding to any statement, but be sure to answer all. **There are no right or wrong answers**. The correct responses are those that are true **for you**.

* Show students your card with the sample item and demonstrate how to mark the word (**only one**) that describes their idea/feeling about the statement. Have them give different answers noticing that there is no better answer than that which ‘fits me’.

(card sample)

|  |
| --- |
| 1. I like my pet sleeping in my bedroom.    * Strongly Disagree ◊Disagree ◊Undecided ◊Agree ◊Strongly Agree |

* Ask students to start answering on their own, and consult you personally only when needed. Guide as needed for understanding of the statement, not the answer.
* When each student is done, ask them to make sure they have answered all items.

Mathematics and Computer Programming Attitude Scale

Students

# Name: Date:

As you read the sentence, you will know how you feel about that idea; please circle the choice that best describes how much you agree or disagree with the statement. Do not spend much time responding to any statement but be sure to answer all. **There are no right or wrong answers**. The correct responses are those that are true **for you**.

|  |
| --- |
| 1. Doing mathematics makes me happier than any other subject.    * Strongly Disagree ◊Disagree ◊Undecided ◊Agree ◊Strongly Agree |
| 1. People should learn mathematics.    * Strongly Disagree ◊Disagree ◊Undecided ◊Agree ◊Strongly Agree |
| 1. I want to become a computer programmer.    * Strongly Disagree ◊Disagree ◊Undecided ◊Agree ◊Strongly Agree |
| 1. Combining mathematics and computer programming is very interesting to me.    * Strongly Disagree ◊Disagree ◊Undecided ◊Agree ◊Strongly Agree |
| 1. I plan to study as much computer programming as possible.    * Strongly Disagree ◊Disagree ◊Undecided ◊Agree ◊Strongly Agree |
| 1. Integrating mathematics with computer programming is a worthwhile and necessary knowledge.    * Strongly Disagree ◊Disagree ◊Undecided ◊Agree ◊Strongly Agree |
| 1. I enjoy mathematics at school.    * Strongly Disagree ◊Disagree ◊Undecided ◊Agree ◊Strongly Agree |
| 1. Computer programming is an important skill to learn.    * Strongly Disagree ◊Disagree ◊Undecided ◊Agree ◊Strongly Agree |

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| 1. I would like to build a project using mathematics.    * Strongly Disagree ◊Disagree ◊Undecided ◊Agree ◊Strongly Agree |
| 1. Computer programming projects are fun.    * Strongly Disagree ◊Disagree ◊Undecided ◊Agree ◊Strongly Agree |
| 1. I can solve mathematics problems pretty easily.    * Strongly Disagree ◊Disagree ◊Undecided ◊Agree ◊Strongly Agree |
| 1. Even though I try hard, computer programming seems very hard to me.    * Strongly Disagree ◊Disagree ◊Undecided ◊Agree ◊Strongly Agree |
| 1. Studying mathematics is a waste of time.    * Strongly Disagree ◊Disagree ◊Undecided ◊Agree ◊Strongly Agree |
| 1. I like creating computer programs that include mathematics.    * Strongly Disagree ◊Disagree ◊Undecided ◊Agree ◊Strongly Agree |
| 1. When a mathematics problem is very difficult, I stick with it until I solve it.    * Strongly Disagree ◊Disagree ◊Undecided ◊Agree ◊Strongly Agree |
| 1. I think I can do well in computer programming.    * Strongly Disagree ◊Disagree ◊Undecided ◊Agree ◊Strongly Agree |
| 1. Mathematics makes me feel confused.    * Strongly Disagree ◊Disagree ◊Undecided ◊Agree ◊Strongly Agree |
| 1. I get a sinking feeling and worry when I think about doing computer programming.    * Strongly Disagree ◊Disagree ◊Undecided ◊Agree ◊Strongly Agree |

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| 1. I can handle most subjects OK, but doing mathematics with computer programming is very hard to me.    * Strongly Disagree ◊Disagree ◊Undecided ◊Agree ◊Strongly Agree |
| 1. Knowing computer programming will help me earn a living.    * Strongly Disagree ◊Disagree ◊Undecided ◊Agree ◊Strongly Agree |

That’s it!

Gracias.

Mathematics and Computer Programming Attitude Scale

Scoring Sheet

ESTRELLA Students

# Name:

Scoring Guide:

**Date:**

1. The answers are scored based on the student’s choice as shown below, and the number is written on the fine line next to item number to which it belongs:

**+**

**-**

100

80

60

40

20

Math Attitude Score

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Strongly Disagree = 1 | Disagree = 2 | Undecided = 3 | Agree = 4 | Strongly Agree = 5 |

1. However, if the answer is marked with an arrow  that means the scores must be reversed, as follows:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1 becomes 5 | 2 becomes 4 | 3 remains 3 | 4 becomes 2 | 5 becomes 1 |

1. After the needed reversals are completed, transfer the scores to the thicker lines and add them up to obtain the pertinent category raw score. Write these sub-totals both next to the category title and in the full- scale/raw-score box on the right. Add them up and obtain the total raw score. Finally, add numbers with an

\* and place total in the \* box. “CP” items address attitudes toward computer programming.

|  |  |  |  |
| --- | --- | --- | --- |
| I. Confidence  *Raw Score*: | II. Usefulness  *Raw Score*: | Full scale raw score:  I. Confidence | |
| 11.    17.    12. CP  16. CP    19. CPM | 2.    20. CP    8. CP    13.    **6. CPM** |
| 1. Usefulness 2. Enjoyment 3. Motivation   **TOTAL** |  |
|  |
|  |
|  |
| \* | |
| III. Enjoyment  *Raw Score*: | IV. Motivation  *Raw Score*: |
| 14. CPM    **18.** CP  1.  10. CP    7. | 4. CPM    **9.**    3. CP    15.    5. CP |

Escala de Actitud en Matemáticas y Programación de Computadoras

Estudiantes de ESTRELLA

# Nombre: Fecha:

Cuando leas cada oración, sabrás como te sientes acerca de esa idea; por favor circula la opción que mejor describa cuánto estás de acuerdo o desacuerdo con los descrito. No tomes mucho tiempo para responder a cada oración, y asegúrate de contestar las veinte opciones. **No hay respuestas correctas o incorrectas**. Las correctas son aquéllas que son ciertas **para tí**.

|  |
| --- |
| 1. Hacer matemáticas me pone más feliz que cualquier otra materia.    * En Completo Desacuerdo ◊Desacuerdo ◊Indeciso(a) ◊De Acuerdo ◊En Completo Acuerdo |
| 1. Toda la gente debería aprender matemáticas.    * En Completo Desacuerdo ◊Desacuerdo ◊Indeciso(a) ◊De Acuerdo ◊En Completo Acuerdo |
| 1. Quiero llegar a ser una/o programadora(or) de computadoras.    * En Completo Desacuerdo ◊Desacuerdo ◊Indeciso(a) ◊De Acuerdo ◊En Completo Acuerdo |
| 1. La combinación de las matemáticas con la programación de computadoras es muy interesante para mí.    * En Completo Desacuerdo ◊Desacuerdo ◊Indeciso(a) ◊De Acuerdo ◊En Completo Acuerdo |
| 1. Planeo estudiar programación de computadoras tanto como me sea posible.    * En Completo Desacuerdo ◊Desacuerdo ◊Indeciso(a) ◊De Acuerdo ◊En Completo Acuerdo |
| 1. La integración de las matemáticas con la programación de computadoras es un conocimiento importante y necesario.    * En Completo Desacuerdo ◊Desacuerdo ◊Indeciso(a) ◊De Acuerdo ◊En Completo Acuerdo |
| 1. Disfruto las matemáticas en la escuela.    * En Completo Desacuerdo ◊Desacuerdo ◊Indeciso(a) ◊De Acuerdo ◊En Completo Acuerdo |
| 1. Aprender a programar computadoras es una habilidad importante.    * En Completo Desacuerdo ◊Desacuerdo ◊Indeciso(a) ◊De Acuerdo ◊En Completo Acuerdo |

|  |
| --- |
| 1. Me gustaría construir un proyecto usando matemáticas.    * En Completo Desacuerdo ◊Desacuerdo ◊Indeciso(a) ◊De Acuerdo ◊En Completo Acuerdo |
| 1. Los proyectos de programación de computadoras son divertidos.    * En Completo Desacuerdo ◊Desacuerdo ◊Indeciso(a) ◊De Acuerdo ◊En Completo Acuerdo |
| 1. Puedo resolver problemas matemáticos fácilmente.    * En Completo Desacuerdo ◊Desacuerdo ◊Indeciso(a) ◊De Acuerdo ◊En Completo Acuerdo |
| 1. Aunque me empeño, la programación de computadoras parece muy difícil para mí.    * En Completo Desacuerdo ◊Desacuerdo ◊Indeciso(a) ◊De Acuerdo ◊En Completo Acuerdo |
| 1. Estudiar matemáticas es una pérdida de tiempo.    * En Completo Desacuerdo ◊Desacuerdo ◊Indeciso(a) ◊De Acuerdo ◊En Completo Acuerdo |
| 1. Me gusta crear programas de computadoras que incluyen matemáticas.    * En Completo Desacuerdo ◊Desacuerdo ◊Indeciso(a) ◊De Acuerdo ◊En Completo Acuerdo |
| 1. Cuando un problema matemático es muy difícil, trabajo duro hasta que lo resuelvo.    * En Completo Desacuerdo ◊Desacuerdo ◊Indeciso(a) ◊De Acuerdo ◊En Completo Acuerdo |
| 1. Pienso que me puede ir bien en la programación de computadoras.    * En Completo Desacuerdo ◊Desacuerdo ◊Indeciso(a) ◊De Acuerdo ◊En Completo Acuerdo |
| 1. Las matemáticas me confunden.    * En Completo Desacuerdo ◊Desacuerdo ◊Indeciso(a) ◊De Acuerdo ◊En Completo Acuerdo |
| 1. Me siento pesado y me preocupo cuando pienso en hacer programación de computadoras.   ◊En Completo Desacuerdo ◊Desacuerdo ◊Indeciso(a) ◊De Acuerdo ◊En Completo Acuerdo |
| 1. Me va bien en la mayoría de cursos, pero al hacer matemáticas con programación de computadoras es muy difícil para mí.   ◊En Completo Desacuerdo ◊Desacuerdo ◊Indeciso(a) ◊De Acuerdo ◊En Completo Acuerdo |
| 1. Saber programación de computadoras me ayudará a ganarme la vida.   ◊En Completo Desacuerdo ◊Desacuerdo ◊Indeciso(a) ◊De Acuerdo ◊En Completo Acuerdo |

¡Eso es todo!

Thanks.