# Motivation, Attitude and Belief Competency toward Teaching Programming

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**Abstract**
The purpose of this study is to develop a two competency component which is motivation and attitude and belief competency for teacher toward teaching programming. This study will describe two competency designed and through a process of validity using Fuzzy Delphi Method (FDM). There are six elements in the motivation competency and ten elements in the attitudes and beliefs competency. Each element in this two competency acquired high value of consensus based on fuzzy Delphi approach. This study is part of the competency model of programming teacher that is being developed.
**Keywords**: Motivation, Attitude, Belief, Programming Teacher, Competency, Fuzzy Delphi

**Introduction**
Development of the teaching profession associated with processes that require knowledge, skills and attitudes that improve the performance of a teacher teaching (Mentz et al., 2013). Therefore, educators are urged to equip themselves with various knowledge, techniques and skills to follow the flow of challenging education world.

Competency refers to the ability to apply knowledge and skills in controlling the process of teaching skills. Competency is defined as the set of knowledge, skills and experience required for the future, stating in activity (Katane et al., 2006). Gupta (1999) defines competence as the knowledge, skills, attitudes, values, motivation and confidence needed to succeed in doing the job. According Copriady (2014), competency also involving personality of teachers in the teaching process with the help of teaching methods, teaching aids and resources for teaching.

Obtaining a better way to teach knowledge programming is a challenge that tests the power and ability of computer science educators. Competency of programming teacher has implications in the improvement of pedagogical innovation. In programming, teacher competence is crucial for the effective exercise of the teaching process. Teachers should have the knowledge and strategies that are effective in delivering lessons in order to accept by

students. This study will explore aspects of motivation and attitudes and beliefs that are required by a programming teacher in the process of effective teaching to students.

**Literature Review**
*Motivation Competency*
Elements of motivation is about an attempt to stimulate teachers to behavior change for the better. Teacher motivation needed to influence students' enthusiasm to learn and help teachers to become effective teachers while monitor student learning (Nor Masharah, Muhammad Modi, & Sulaiman, 2017).

Motivation defines as internal situation that initiate, direct and maintaining our behavior in the matter (Akdemir & Arslan, 2013). According Yuliyani (2010), the competency of teachers were found to have factors influenced by educational background, teaching experience and teaching motivation. She also said the motivating factors could encourage behavior of teachers in the teaching process. The report of the working group ITiCSE: Informatics in Secondary Education  (Hubwieser et al., 2011) describes that the educators in the field of computational faces lack of knowledge and motivation in teaching.  According to Selvi (2010), competent teachers also assessed from the aspect of motivation in teaching process. In addition, study by Bjekić et al., (2014) and Yuliyani (2010), motivation plays an important role in influencing the performance level of teaching and learning.

Motivation is a factor which is dominant and can produce an effective working level. In this study, competence motivation is related to the drive and enthusiasm that can affect teachers who teach programming.  In short, strong motivation will have a significantly positive impact on the teaching and learning process.

*Attitude and Belief Competency*
Development of elements attitudes and beliefs competency are closely related to the influence exerted with motivation competency. Teachers play an important role to guide students in providing direction for the learning process. Teacher as a facilitator will provide teaching scenario (Saeli et al., 2012).

Attitudes and beliefs is an important concept in understanding the process of thought, the practice in class, changes and learn to teach (Richardson, 1996). This refers to the attitudes of teachers when teaching programming, the level of confidence and trust in the process of teaching and learning programming. Taking explanation by Hew and Brush (2007), attitude can be defined as a certain feeling that indicates whether likes it or not against teaching process. In the context of this study showed what teachers' attitudes should have toward teaching programming.

Belief is defined as the assumptions or thinking about something that felt true (Richardson, 1996) including confidence teachers on teaching and learning (Hew & Brush, 2007). According to the study by Richardson (1996) again, belief often related with the issue of teachers' knowledge and actions as well as teachers in the classroom. The concept of the relationship between teachers' beliefs and teaching practices in the classroom are mutually dependent. He explained that the factors influencing teacher attitudes and personality factors specific beliefs and behaviors relatively stable.
This competency is important in influencing the actions of the teacher while teaching programming are conducted. A good faith in belief will encourage attitude and good behavior in programming lessons. Likewise, study by Mohd Najib and Li (2013) and Selvi (2010), which highlighted the elements of attitudes and beliefs as factors to become a competent teacher.

Additionally, the attitude and belief of teachers are important aspects that need to be given strong emphasis in the development of competency of programming teachers. Such emphasis is to be expected, given that teachers' attitude and belief reflect their personalities, characters, and emotions that in unison will influence students to remain steadfast in their learning (Selvi, 2010). In general, teachers' attitude and belief are interrelated with other skills and knowledge that are important in developing a competency framework (Margaritis et al., 2015; Yu, Luo, Sun, & Strobel, 2012) which can help efforts to produce competent teachers many important fields.

**Methodology**

This main purpose of this study was to identify two competency element which is motivation and attitude and belief for programming teachers. This study was carried out by exploring and determining the characteristics of competent programming teachers through a critical review of the literature and need analysis survey (Nor Masharah et al., 2017). In particular, the review was focused on the motivation and attitude and belief competency of teachers in teaching computer science in schools. The conceptualized element were validated by a panel of experts consisting of 22 practitioners, who had selected based on their excellent academic qualifications and expertise in the field of programming more than 10 years.

The validation of the competency element were using the Fuzzy Delphi Method (FDM) based on a survey or an interview for obtaining consensus from the panel of experts. This method was first introduced by Murray et al. (1985) and then revised by Kaufmann & Gupta, (1988) using a combination of fuzzy set numbering or fuzzy set theory. This method is used to obtain quick and precise validation of factors or elements in the form of a consensus of experts in a single round (Mohd Ridhuan, Saedah, Zaharah, Nurulrabihah, & Ahmad Arifin, 2014). Furthermore, the strength of the FDM lies in its ability to produce consistent validation results (Habibi, Sarafrazi, & Izadyar, 2014), and it is an effective technique that does not require many rounds of validation (Norlidah, Fuziah, Rosman, Mohd Nazri, & Dewitt, 2015).

The analysis of data was done following using the fuzzy rules which is triangular fuzzy number and defuzzification process. Triangular Fuzzy Number produce a scale similar to a Likert scale used to translate the variables to fuzzy numbers. For this study, the 5-point Likert scale used was based on a continuum of positive and negative responses (levels of agreement and disagreement). Table 1 summarizes the Likert scale and values of the triangular fuzzy number.

Table 1.

Specified of Likert scale and triangular fuzzy number

| Response | Triangular fuzzy | Likert Scale |
|---|---|---|
| Strongly disagree | .00, 0.00, 0.20 | 1 |
| Disagree | .00, 0.20, 0.40 | 2 |
| Moderate Agree | .20, 0.40, 0.60 | 3 |
| Agree | .40, 0.60, 0.80 | 4 |
| Strongly agree | .60, 0.80, 1.00 | 5 |

To obtain the consensus of experts for each item, the threshold value (d) should not exceed 0.2, which means all the experts agree with the statement of that particular item (element). Otherwise, a second round of survey is needed to determine whether the items are relevant or not (Cheng & Lin, 2002). FDM also involves the process of determining the level of

agreement of the expert for the overall item or individual item of the construct. If the calculated level is more than or equivalent to 75% and the value of each item of defuzzification exceeds 0.5, each item is assumed to have reached a high consensus from the experts (Chu & Hwang, 2008).

**Findings and Discussion**

The component of motivation competency and attitude and belief competency of programming teacher had been validated by a group of experts who have vast expertise and experience in teaching programming. The validity of the element is the measure of beliefs relating to the components of the competency that are considered important using a questionnaire that contains relevant items related to the components of the content and pedagogical constructs.

Through this process, several items had been modified or amended to comply with the learning objectives, student needs, and programming proficiency of teachers. Finally, this process yielded six essential elements of motivation components and 10 element of attitude and belief competency as summarized in Table 2 and Table 3.

Table 2.
The elements of the motivation competency

| No. | Element |
| --- | --- |
| 1 | Love do exercises to improve programming skills |
| 2 | Feeling happy to teaching programming |
| 3 | Satisfied if students can complete assignments given |
| 4 | Like creating a cheerful ambience to stimulate student learning |
| 5 | The challenges in teaching programming be an impetus to teaching |
| 6 | Always enlightening students about the importance of programming in everyday life |

The element of attitude and belief competency relate to the teacher behavior, self-reliant and reliance in teaching programming process (see table 3).

Table3.
The elements of the attitude and belief competency

| No. | Element |
| --- | --- |
| 1 | Trying to increase knowledge of programming concepts |
| 2 | Trying to learn about innovative concepts and new ideas in programming |
| 3 | Discuss and share your experience in programming with other teachers |
| 4 | Able to receive feedback from students, colleagues and the institution |
| 5 | Confident in carried out teaching programming |
| 6 | Confident in adjusting teaching methods to the topics taught in programming |
| 7 | Trying to expending knowledge and programming skills while teaching |
| 8 | Understanding the impact of programming solutions to society and everyday life |
| 9 | Trying to understand the students, including the level of knowledge and their ability |
| 10 | Encourage students to increase their knowledge in the context of wider programming (such as mobile apps, web server) |

### Fuzzy Delphi Analysis

Fuzzy Delphi Method were using to carry out the data analysis to determine the level of consensus among the panel of experts. The principle used to establish whether the consensus among the experts was based on the percentage of agreement exceeding 75% and the value of each item of defuzzification exceeds 0.5. Table 4 summarizes the results of the Fuzzy Delphi analysis, showing the calculated fuzzy weights, threshold values, and percentages of agreement of the motivation competency.

Table 4.
The fuzzy weights, threshold values, and percentages of the motivation competency

| Bil | Items of competency | Fuzzy weight | Threshold value, d | Percentage of agreement |
|-----|---------------------|--------------|--------------------|-------------------------|
| 1 | Love do exercises to improve programming skills | 0.50, 0.70, 0.90 | 0.18 | 91% |
| 2 | Feeling happy to teaching programming | 0.52, 0.72, 0.92 | 0.14 | 100% |
| 3 | Satisfied if students can complete assignments given | 0.45, 0.65,0.85 | 0.14 | 95% |
| 4 | Like creating a cheerful ambience to stimulate student learning | 0.47, 0.67, 0.87 | 0.19 | 86% |
| 5 | The challenges in teaching programming be an impetus to teaching | 0.45, 0.65, 0.85 | 0.18 | 86% |
| 6 | Always enlightening students about the importance of programming in everyday life | 0.47, 0.67, 0.87 | 0.19 | 86% |

Clearly, each element in the motivation competency reached a threshold value (d) of less than 0.2, indicating that it received a strong consensus from all the experts (Cheng & Lin, 2002). Similarly, the percentages of agreement of experts for all the items were more than 75%. Based on these two findings, the consensus reached by the experts was deemed high (Chu & Hwang, 2008).

Table 5.
The fuzzy weights, threshold values, and percentages of the attitude and belief competency

| Bil | Items of competency | Fuzzy weight | Threshold value, d | Percentage of agreement |
|-----|---------------------|--------------|--------------------|-------------------------|
| 1 | Trying to increase knowledge of programming concepts | 0.49, 0.69, 0.89 | 0.12 | 100% |
| 2 | Trying to learn about innovative concepts and new ideas in programming | 0.48, 0.68, 0.88 | 0.14 | 100% |
| 3 | Discuss and share your experience in programming with other teachers | 0.47, 0.67, 0.88 | 0.19 | 86% |
| 4 | Able to receive feedback from students, colleagues and the institution | 0.50, 0.70, 0.90 | 0.14 | 100% |
| 5 | Confident in carried out teaching programming | 0.47, 0.67, 0.87 | 0.15 | 100% |
| 6 | Confident in adjusting teaching methods to the topics taught in programming | 0.41, 0.61, 0.81 | 0.18 | 86% |

| 7 | Trying to expending knowledge and programming skills while teaching | 0.49, 0.69, 0.89 | 0.16 | 95% |
|---|---|---|---|---|
| 8 | Understanding the impact of programming solutions to society and everyday life | 0.46, 0.66, 0.86 | 0.15 | 95% |
| 9 | Trying to understand the students, including the level of knowledge and their ability | 0.44, 0.64, 0.84 | 0.16 | 86% |
| 10 | Encourage students to increase their knowledge in the context of wider programming(such as mobile apps, web server) | 0.44, 0.64, 0.84 | 0.16 | 95% |

Likewise, all items of the attitude and belief competency gained threshold values (d) of less than 0.2 and the percentages of agreement of experts for all the items were more than 75%. Together, these findings, which according to Cheng and Lin (2002), indicate that the experts had reached a strong consensus regarding the relevancy and reliability of the element of these component competency.

Evidently, the Fuzzy Delphi analysis presented that the experts strongly agreed with the element of the motivation competency and attitude and belief competency. Based on the threshold value (d) of all element in both components were quite remarkable, ranging from 0.12 to 0.19, suggesting that the experts had reached a strong consensus of the their inclusion in the element of competency. Also, for the defuzzification values were quite impressive, ranging from 86% to 100%. Again, a strong agreements of experts was registered, reinforcing the appropriateness of the element in the both component.

**Conclusion**

Learning requires emotional support to create positive feelings for teaching learning process. Along with the findings by Selvi (2010) which says that the competency embodies the values, morals, beliefs, attitudes and motivation, the teacher can help a student's readiness to learn in addition to effectively monitor student learning. Teachers learning to become a consultant and mentor to the student's learning.

Elements of motivation competency is about an attempt to stimulate teachers to behavior change for the better. Teacher motivation needed to influence student's enthusiasm to learn and help teachers to become effective teachers while monitor student learning. The process of teaching and learning need a good motivation for building a positive feeling and affecting effective teaching sessions. Based on findings, there are six elements that should motivate teachers instilled in producing competent programming teachers. Attitude and belief competency are focused on the style, behavior and character of teachers in teaching programming. Generally, aspects of teacher attitudes and beliefs often linked to produce a competency framework and associated in producing teachers who are competent in any field. So researchers have compiled a list of 10 elements of the attitudes and beliefs that must be nurtured by teachers in teaching programming.

Both competency of teachers is important to encourage and motivate teachers to strive towards a change in behavior and attitude of the better and implement the perfect teaching. This includes having the eternal enthusiasm in assisting students in learning by monitoring the student in the learning problems that constantly create positive feelings and emotions expressed support or encouragement to students in the teaching process. The process of teaching and learning requires a good motivation for building a positive effect and influence of effective teaching sessions.

## References

Akdemir, E., & Arslan, A. (2013). Development of Motivation Scale for Teachers. *Procedia - Social and Behavioral Sciences*, *106*, 860–864. https://doi.org/10.1016/j.sbspro.2013.12.098

Bjekić, D., Vučetić, M., & Zlatić, L. (2014). Teacher Work Motivation Context of In-service Education Changes. *Procedia - Social and Behavioral Sciences*, *116*, 557–562. https://doi.org/10.1016/j.sbspro.2014.01.257

Cheng, C.-H., & Lin, Y. (2002). Evaluating the best main battle tank using fuzzy decision theory. *European Journal of Operational Research*, *142*, 174–186. https://doi.org/10.1016/S0377-2217(01)00280-6

Chu, H. C., & Hwang, G. J. (2008). A Delphi-based approach to developing expert systems with the cooperation of multiple experts. *Expert Systems with Applications*, *34*(4), 2826–2840. https://doi.org/10.1016/j.eswa.2007.05.034

Copriady, J. (2014). Teachers Competency in the Teaching and Learning of Chemistry Practical. *Mediterranean Journal of Social Sciences*, *5*(8), 312–318. https://doi.org/10.5901/mjss.2014.v5n8p312

Ghafar, M. N., & Li, L. T. H. (2013). The competent teacher- A survey of department heads in Faculty of Education. In *Seminar Majlis Dekan-Dekan Pendidikan (MEDC)*. Retrieved from http://www.medc.com.my/medc/seminar_medc/fromCD/pdf/41.pdf

Gupta, K. (1999). *A Practical Guide for Need Assessment*. San Francisco: John Wiley & Sons. Inc.

Habibi, A., Sarafrazi, A., & Izadyar, S. (2014). Delphi Technique Theoretical Framework in Qualitative Research. *The International Journal Of Engineering And Science*, 2319–1813. https://doi.org/10.1016/S0169-2070(99)00018-7

Hew, K. F., & Brush, T. (2007). Integrating technology into K-12 teaching and learning : current knowledge gaps and recommendations for future research. *Education Tech Research Dev*, *2nd*, 223–252. https://doi.org/10.1007/s11423-006-9022-5

Hubwieser, P., Armoni, M., Dagiene, V., Diethelm, I., Giannakos, M. N., Knobelsdorf, M., … Schubert, S. (2011). Computer Science / Informatics in Secondary Education. In *Proceedings of the 16th annual conference reports on Innovation and technology in computer science education (ITiCSE)* (pp. 19–38). Darmstadt, Germany: ACM. https://doi.org/10.1145/2078856.2078859

Katane, I., Aizsila, A., & Beitere, Z. (2006). Teacher competence and further education as priorities for sustainable development of rural school in Latvia. *Journal of Teacher Education and Training*, *6*, 41–59.

Kaufmann, A., & Gupta, M. M. (1988). *Fuzzy mathematical models in engineering & management science*. *Elsevier Science Inc*. New York: Elsevier Science Publisher. https://doi.org/10.1016/0377-2217(89)90024-6

Margaritis, M., Magenheim, J., Hubwieser, P., Berges, M., Ohrndorf, L., & Schubert, S. (2015). Development of a Competency Model for Computer Science Teachers at Secondary School Level. In *IEEE Global Engineering Education Conference (EDUCON)* (pp. 211–220). Tallinn, Estonia: ACM New York, USA. https://doi.org/10.1145/2462476.2465607

Mentz, E., Bailey, R., & Breed, B. (2013). Empowering Information Technology teachers through professional development : An evaluation. In *Proceedings of the 8th Workshop in Primary and Secondary Computing Education (WiPSE '13).* (pp. 37–38). Aarhus, Denmark. https://doi.org/10.1145/2532748.2532775

Mohd Ridhuan, M. J., Saedah, S., Zaharah, H., Nurulrabihah, M. N., & Ahmad Arifin, S. (2014).

*Pengenalan Asas Kaedah Fuzzy Delphi Dalam Penyelidikan Rekabentuk Pembangunan*. Bangi: Minda Intelek.

Murray, T. J., Pipino, L. L., & Gigvh, J. P. van. (1985). A pilot study of fuzzy set modification of Delphi. *Human Systems Management*, *5*(1), 76–80. Retrieved from http://content.iospress.com/articles/human-systems-management/hsm5-1-11

Nor Masharah, H., Muhammad Modi, L., & Sulaiman, S. (2017). The Need for a Competency Model of Programming Teachers : a Need Analysis Survey. *International Journal of Scientific and Research Publications*, *7*(6), 265--269.

Norlidah, A., Fuziah, Rosman, Mohd Nazri, A. R., & Dewitt, D. (2015). The potential of video game in Malay language learning for foreign students in a public higher education institution. *Procedia - Social and Behavioral Sciences*, *176*, 1020–1027. https://doi.org/10.1016/j.sbspro.2015.01.573

Richardson, V. (1996). The role of attitudes and beliefs in learning to teach. In J. Sikula (Ed.). In *Handbook of research on teacher education*. New York: Macmillan.

Saeli, M., Perrenet, J., Jochems, W. M. G., & Zwaneveld, B. (2012). Programming : Teachers and Pedagogical Content Knowledge in the Netherlands. *Informatics in Education*, *11*(1), 81–114.

Selvi, K. (2010). Teachers ' Competencies. *International Journal of Philosophy of Culture and Axiology*, *7*(1), 167–176.

Yu, J. H., Luo, Y., Sun, Y., & Strobel, J. (2012). A Conceptual K-6 Teacher Competency Model for Teaching Engineering. *Procedia - Social and Behavioral Sciences*, *56*, 243–252. https://doi.org/10.1016/j.sbspro.2012.09.651

Yuliyani, H. (2010). *Hubungan Antara Pengalaman Mengajar Dan Motivasi Mengajar Dengan Kompetensi Guru Pendidikan Pancasila Dan Kewarganegaraan Di Sekolah Menengah Pertama Di Kabupaten Karanganyar*. Universitas Sebelas Maret,Sukarta.