The Anticipation: How to Solve Problem in Integral?

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Abstract.This research is motivated by the interest of researchers to the phenomenon of the ability of thepreservice teacher to solve problems integral to how to anticipate. It isbecause a preservice teacher to solve the problem using the integral another way to illustrate a given problem then just finish it. Anticipation in this study consisted of (1) interpreting, (2) predicting a result, and (3) foreseeing an action. This research aims to know how the preservice teacher who have the cognitive style field independent in solving problems of integral. The method used is the method of test and interview. The test consists of an essay and interview used an unstructured interview. The results obtained by the preservice teacher to solve the problems of integral to analyse a given problem through an initial guess (predicting) then do the problem, not in detail (foreseeing), but the conclusions are true. Preservice teacher in this study can be categorised in explorative anticipation

1. Introduction

The mathematics still often considered difficult for students. Many researchers mathematics education focus to improving students' ability in solving mathematical problems well. However, theyhave not yet to find out about students' ability in solving mathematical problems. Piaget's notion of anticipation is about intelligence. The Intelligence is a particular instance of biological adaptation and drew parallels between intellectual adaptation, and organic (i.e. physiological) adaptation, an essential characteristic of both is that strive towards equilibrium[1]. Organic adaptation refers to the readjustment of the sensorimotor structures in response to pressures from the changing environment for survival. Intellectual adaptation refers to the reorganisation of the conceptual structures to eliminate cognitive conflicts. Notion anticipation by[2] in anticipation, sometimes students need also foresight/predict any mental act performed.

Every step a person in solving the problem has a shadow of the future (certain final solution) followed by way of thinking and way of understanding that interacting in the brain although the foreseeing/predicting is false. This certain final solution means that every step/certain stage of a problem that is solved, then it has a temporary solution before next stage proceeding.

Notion of anticipation by identifying three general types of anticipation: (a) implicit expectations that are present in our action, e.g., the preparation and control of our movements when we grope in the dark; (b) explicit expectation of an outcome based on certain cause-effect relationships (e.g., predicting that it will soon rain upon noticing that dark clouds are covering the sky); (c) anticipation of a desired event and the means for attaining it (e.g., a child's foresight of the means to get his parent to give in, say by throwing a temper tantrum in public)[1][3].

The three constructs mental act, away of understanding (WoU), and way of thinking (WoT) form a triad, as depicted in Figure 1[4][5].

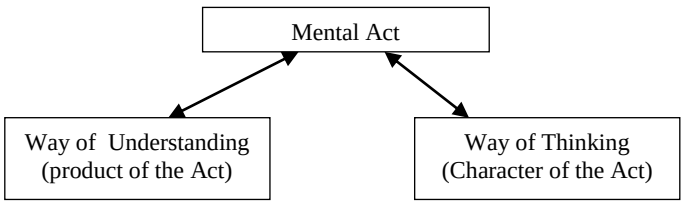

Figure 1. Harel's MA-WoU-WoT Triad

The researcher provide the triad of MA-WoU-WoT with a means analyzing based on student's statements and actions, what a student understands of a phenomenon or particular thing (i.e., what the product of the student's mental act is); and subsequently infer the manner (i.e., character of the act) in which the student engages a particular mental act to arrive at that way of understanding. Ways of understanding are neutral in the sense that it merely a certain product of a mental act and doesn't suggest what a student understands or doesn't understand. Nevertheless, a student's WoU may be desirable or undesirable about those that have been accepted by the mathematical community at large.

The students develop WoT only through the construction of WoU, and the WoU they produce are determined by the WoT they possess[6]. This principle importance of incorporating complementary WoU and WoT into cognitive objectives for instruction, which should help students reason independently and solve theproblem in mathematics. The mathematics teachers focus on imparting ways of understanding such as definitions, rules, algorithms, solutions, theorems, and proofs, without attempting to help students develop desirable WoT[6]:

> "We have observed that teachers often form, at least implicitly, cognitive objectives regarding ways of thinking, but their efforts to teach ways of thinking is often counterproductive because these efforts do not build on ways of understanding. Conversely, teachers often focus on ways of understanding but overlook the goal of helping student's abstract effective ways of thinking (WoT) from these ways of understanding (WoU)."

The implementation of WoU and WoT involves: (a) attending to students existing WoU and WoT; (b) identifying appropriate cognitive objectives, appropriate in the sense that they are aligned with student's current WoU and WoT, and that they preserve the mathematical integrity of the content; and (c) designing activities, with an understanding of the interplay among various WoU and WoT, to meet those objectives.

Teaching is the ways of thinking directly to students is unproductive[6]. According to the WoU and WoT [4], it is through the construction of WoU that students develop WoT; conversely, it is through the application of WoT that students develop their WoU. These WoU may be deficient initially but can be progressively refined towards those that are institutionalised (i.e., accepted as correct and useful by the mathematics community). Hence, the target WoT and WoU must complement each other, so that applying certain WoT will lead to the development of certain WoU, which may help to cultivate target WoT.Five anticipation that is: (1) impulsive anticipation is spontaneously proceeded with the idea that comes to mind without analyzing the problem situation and without considering the relevance of the idea to the problem situation, (2) interiorized anticipation is spontaneous proceeds with an idea without having to analyze the problem situation because one has interiorized the relevance of the anticipated action to the situation at hand, (3) analytic anticipation is analyzed the problem situation and establishes a goal or a criterion to guide one's actions, (4) explorative anticipation is explores an idea to gain a better understanding of the problem situation, and (5) tenacious anticipation is maintains and does not reevaluate one's way of understanding (prediction, problem solving approach, claim, or conclusion) of the problem situation in light of new information[2].

2. Method

The purpose of this research is to know how the preservice teacher who have the cognitive style field independent in solving problems of integral. The method used is the method of test and interview. The test consists of an essay and interview used an unstructured interview. During an investigation, the researcher acts as the main instrument that means where researchers cannotbe replaced by someone

else or something else. In this research did not manipulate a variable too, but preferably things that do preservice teacher at the time of data collection activities.Thus, this research used a qualitative approach [7]. Subjects in this research were preservice teachers fourth semesters of mathematics education with field-independent cognitive style.

3. Result and Discussion

The problem was given to astudent is:

Which the larger between $\int_0^1 x\,dx$ or $\int_1^2 x\,dx$? Explain, please!

The predicting and foreseeing these research that is: (1) predicting (a result) is the mental act of conceiving an expectation for the result of an event without actually performing the operations associated with the event, and (2) foreseeing (an action) is the mental act of conceiving an expectation that the leads to the volition for an action, prior the performing the operations associated with the action[2].

The subject began reading the problem with mumbling and then explained the purpose of the repeat question (not detailed) given aproblem. When researchers re-confirm the aim of the question, the subject try to theunderstanding of problem for 2 seconds and then answer that "*di soaliniditanyakanhasilyangterbesarantara integral kiri dan kanan*". This is consider preservice teacher respons.

P : Maksud soal apa mas? (menanyakan kedua kalinya)
F : Di soal ini ditanyakan hasil yang terbesar antara integral kiri dan kanan (menunjuk soal)
P : Integral kiri dan kananya?
F : Iya ... (berpikir 5 detik) hem ... maksudnya hasil integralnya pak
P : O hasilintegralnya ya?
F : Iya pak ... jadi jika ini diintegralkan .. dikerjakan yang kiri hasilnya sesuatu dan yang kanan juga hasilnya sesuatu nanti hasil keduanya dibandingkan. Yang paling besar itu jawabnya pak

In the prediction phase, the subject answered that the answer of that question is right. This means the best results is $\int_1^2 x\,dx$. The consider preservice teacher respons below.

P : Kira-kira menurut mas hasilnya apa ya? ***Predicting***
F : Hasilnya .... (berpikir 10 detik)yang kanan pak yaitu $\int_1^2 x\,dx$
P : Trus
F : Maksudnya pak?
P : Dari mana masbisamenjawabitu?
F : Ini pak kalau kita gambar (subjek tidak menggambar tapi menjelaskan dengan memainkan tangannya) yang kiri melalui nol dan sampai satu sedangkan yang kanan juga melalui nol tapi dari satu sampai 2. Jadi lebih luas kanan.
P : terus
F : Ya jelas jawabannya lebih besar yang kanan pak.
P : O...o...

While foreseeing, the subject in finishing the problem for five seconds is donewhile thinking about the results obtained.It isevident from the answers of a subject that are integral to the right is larger. Then, when the subject asked to indicate the results which have been obtained, the subject began to explain the results that have been obtained (prediction). Consider the following interview excerpts.

P : Menurut pendapat mas, kira-kira jawaban dari soal itu apa mas? ***(Predicting)***
F : (berpikir5detik) yang kananpak
P : Yakin?
F : Yakin pak
*P : Coba tunjukkanmz! (**Foreseeing**)*
F : Ini yang integral kiri gambarnya seperti ini (gambar sebelah kiri dengan batas 0 sampai 1) sedangkan yang integral kanan gambarnya seperti ini (gambar

sebelah kanan dengan batas 1 sampai 2)
P : Yakin mas?
F : Iya yakin …

The subject explains the problem based on geometric shapes. Based on the excerpts of the interview above, subject verbally explains that "this integral picture left like this (*gambarsebelahkiridenganbatas 0 sampai 1*) while the integral right of the picture like this (picture to the right with a limit of 1 to 2)". The explanation of the subject can be seen in figure 2 below.

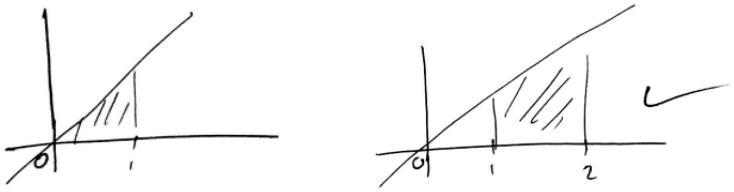

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Figure 2. Foreseeing of Subject (Geometry Shape)

In the Figure 2.a, subject describes the functions $\int_0^1 x\,dx$ and the figure 2.b; the subject describes the functions $\int_1^2 x\,dx$ based on geometric shapes. The subject compares both of these functions using a graphic illustration. He assumed that the area $\int_1^2 x\,dx$ wider than the area $\int_0^1 x\,dx$ So that the subject concluded that the function of the right side is larger than the function of the left side. Alsoby using the geometric form, the subject also calculations for convinced researchers on this problem. The result of the calculation subject can be seen in the following figure.

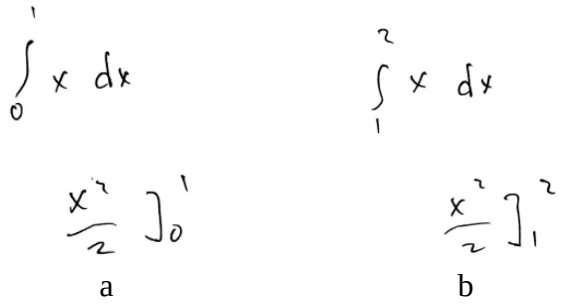

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Figure 3. Foreseeing of Subject

The subject explained that the calculation results together equal the results made of a sketch graph (Figure 2). When the subject is substituting the boundaries of function $\int_0^1 x\,dx$ and function $\int_1^2 x\,dx$ the subject goes on to explain the results to be obtained the larger is the right side. The importance of conceptual structures to solving the problem that "the basic and the most determine anticipation is a conceptual structure[8]. Building the confidence of students, [9] said that the importance of anticipating student responses in resolving the problem. This method is used to build a strategy on how students in solving mathematical problems. Furthermore, [10] said that current students need anticipation guide in solving a mathematics problem. However, students with high math ability are not necessarily anticipated analytically. These results were reported by [11] that student high mathematical ability internationalised anticipation. As a note, theunsuccessful anticipation of student thinking might reveal to teachers' need to rethink the ways in which learning occurred in the classroom. What is purely an error of students? It is also probably because of there are contributions from teachers. What is purely an error of students? No, it is also possible there are contributions from

teachers. This case was reported by [12] that equally important is a teacher's ability of further accommodate students learning when there is a mismatch between the teacher and student perspectives.

Based on above that can be concluded the subject using explorative anticipation. It can be seen from the way the subject matter of counting and drawing the illustrations in front of the subject face. Based on research reports [13] regarding the anticipation of explorative (1) read the questions more than once, (2) the finding might ask and what is known, (3) outlining the problem in detail, (4) incorporate criteria known, and (5) solve the problem by considering an alternative solution. Further results of the study [14] if subject explorative anticipation, then the subject will try (trial and error) even though in the end the subject right in understanding it.

4. Conclusion

Based on the above results it can be concluded that preservice teacher to solve the problems of integral to analyse a given problem through an initial guess (predicting) then do the problem is not in detail (foreseeing) but the result is true. The results of this research subject can be categorised in explorative anticipation.

5. References

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