Vygotsky Theory Based on Mathematics Literacy in The New Normal Era

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Abstract

Theory teaching and learning very calculated in influencing a history and culture as well as confess that school, besides reproduce knowledge, also reproduce injustice social. This article focuses on activity of literacy mathematics through interaction social in context certain, no on performance Skills someone 's math in isolation from context. It is in focus on practice activity literacy mathematics as culture, history, and political. Perspective practice social on literacy mathematics no ignore importance learning based school or skills technical. This paper aims to convey the actualization of theory based literacy math, so could give contribution.

Keywords: actualization, new normal, literacy mathematics

INTRODUCTION

Beginning of 2020, participants educate experience obstacle in the process of activities study. Since site the condition of covid-19 ravaged the world that made all learning process must diverted to online learning. Learning with online way still many once experienced obstacles. Plus, with duration time activity shortened learning with destination reduce the spread of covid-19. Since condition Covid-19 pandemic starts getting better, government start allow learning stare advance however with limitation amount students and duration short time (limited). Learning stare advance not yet fully could walk normally. Learning permanent based stare face and collaborate with online learning.

Hybrid learning is one of a process for get knowledge. Hybrid learning is learning with combine various type form learning for example learning stare face, online, etc (Surjono, 2010). Hybrid learning defined as fusion among method study stare face (in class) with the material provided online (Bibi & Jati, 2015). Learning this is form innovative from development learning stare face and learning online. Success from a learning model depends from characteristics participant teach. Thing this in accordance with that expressed by Nakayama et al (2007) that from all e-learning literature indicates that no all participant educate will success in online learning, because existence factor environment learning and characteristics participant educate (Purmadi & Hadi, 2018) .

Hybrid learning is learning that has been existence change in time shared becomes learning by direct with method stare face inside class and the rest learning conducted online with more time flexible. According to Garnham and Kaleta (2002), hybrid learning takes approach evolutionary in online learning, where student permanent still use learning stare face in class (Teije, 2021) .

Hybrid learning is perfect used for learning during this covid-19 pandemic. Hybrid learning identical with blended learning. Hybrid learning is combination between learning models stare advance with online learning. Hybrid learning have advantages that is capable make student becomes active and learning student centered. This thing naturally will make pattern think student more grow and can increase ability think creative student in thing solving problems with questions mathematics especially on material get up space. A teacher can become facilitator in application of the hybrid learning. The hybrid learning learning model has a number of function among them that is communication among students and teachers mutually play a role active, increase community collaboration learn, train student for independent in learn and build active and interactive learning (Son, 2015).

Learning model hybrid learning in general facilitated by media such as power points, short videos, digital applications such as edmodo, google classroom, etc. Learning conducted with mix among learning stare advance and online learning with media assistance or online digital platforms as means between teachers and students for to do learning and communication. Hybrid learning can increase experience study active and learning and student centered. Student will play a role active in the learning process which includes learning based projects, tasks, or experiment independent (Khotimah, 2020) .

Learning model hybrid learning expected could develop ability think creative student in learn mathematics especially on material get up space. According to Arikunto (2010: 137) application there is hybrid learning a number of stages application among them step planning, stage action, stage observation, and stages reflection (Kusdiyanti et al., 2021) .

Superiority from the hybrid learning learning model can create conditions and atmosphere comfortable as desired students. There is a number of influencing factors success online learning. There is two factor that is internal factors and external factors to be influence success in study online. Influence from internal factors include personality, motivation, intelligence, and high curiosity. Whereas for external factor that is speed internet access, and tools technology used (Sulistyanto, 2021).

Mathematical literacy is an individual's capacity to formulate, employ, and interpret mathematics in a variety of contexts. Mathematical literacy is ability a individual formulate, use, and interpret mathematics in various context (OECD, 2018). From definition the seen that Mathematical literacy have role important in help student complete problem which related with application mathematics in life everyday.

Importance communication and collaboration in environment class has becomes element important education quality during many years (Astleitner, 2005; Hunt et al., 2009; NCTM, 2000). However, communication and interaction often ignored, in teaching and learning mathematics (NCTM, 2000, 2009b; Phillips et al., 2009; Turners, 2011). Communication sustainable good written nor form verbal important in class mathematics because I represent you ability in build Skills *Mathematical Literacy* that important for increase understanding and performance mathematics by whole (Thompson & Chappell, 2007; Turners, 2011; Wood et al., 2011).

Teacher must responsible answer for involve student in various situation use math language because student usually no have opportunity which enough in outside class for do it (Thompson & Chappell, 2007). Murray (2004) that student must use say at least 30 time for use with fluent and comfortable alone. By because that, increase *Mathematical Literacy* is very depend on opportunity communication which created by teacher (Özgen & Bindak, 2011; Thompson & Chappell, 2007). Realize importance role communication in success learning mathematics, though received by large however standard in the practice mathematics and study which support communication as part important from learning,

many teacher mathematics ignore opportunity for combine communication and Skills in build *Mathematical Literacy* for student (Phillips et al., 2009; Thompson & Chappell, 2007; Seibert & Draper, 2008; Turners, 2011).

Theory play a number of very important role in study for resolve problem, produce data which in accordance and show data as results analysis which could trusted and mean (Silver & Herbst, 2007). With provide tool and language for describe, understand, and explain phenomenon which observed, theory could allow researcher for make prediction about connection and structure implementation investigation. By because it, theory could understand as guide practice study and becomes destination practice study (Bikner-Ahsbahs & predictor, 2014).

Study put forward theory teaching and learning taken into account for influence history and culture and confess that school, besides reproduce knowledge, also reproduce injustice social. By because it, I consider literacy mathematics as practice social (Yasukawa et al., 2018). Perspective this focus on what which person do with literacy mathematics through interaction social in context certain, no on performance Skills mathematics someone in isolation from context. This thing focused on practice activity literacy mathematics as culture, history, and politics.

Perspective practice social on literacy mathematics no ignore importance learning based school or skills technical. However, this show that knowledge and skills mathematics without context no allow person becomes participant which productive in community certain. Theory activitycultural-historical allow researcher for make a fuss method practice literacy mathematics certain has formed or disturbed by rule and tradition, tool and instrument mediation which available, and community in where practice literacy mathematics have meaning and score (Yasukawa et al., 2018). By because it, in study which reported in here, I take perspective cultural-historical from teaching and learning. In chapter this, given review history short about development and foundation theory activity cultural-historical. Next, served perspective theory cultural-historical on teaching and learning math, theory objectivity. Finally, our could connect perspective cultural-historical with literacy mathematic.

RESULTS AND DISCUSSION

Theory activity culture-history (*Cultural Historical Activity Theory* - CHAT)

Theory activity developed from psychology cultural-historical Russia in the 1920s and 1930s (Captellin & Nardi, 2009). Psychology Russia influenced by philosophy Marxist and idea fundamental that interaction among subject and object activity character social. Psychologist Russia Lev Vygotsky considered has put basics theory activity. For Vygotsky, it was is problem fundamental that culture and society involved direct in shape nature thought human. Man develops meaning and score with adapt meaning and score which already there is in world. Ideas psychology cultural-historical brought more carry on by a student Vygotsky, Alexey Leont'ev, which assimilate it to in system draft and principle which known as theory activity (Captellin&Nardi, 2009).

Activity no can equate with activity as series action anddeed (like *Activität* in language German and *aktivnost* in language Russia). On the contrary, Activity refers to on Tätigkeit German *or* deyatel'nost *' Russia,* which refers toon system dynamic which directed on satisfaction needs collective. By because it, I use letter capital "A" moment refer Activity as system dynamic and letter small "a" moment refer activity as suite action.

In chat, Activity considered as category organizing central. Activity is moment structural society that produces something for needs general and general as part from distribution work (Roth & Radford, 2011). By because it 's an activity produce aspect psychic from life everyday where the inner world and the worldoutside connected and no could reduced one same another. In and through participation them, student reproduce practice school, society, and culture.

Activity is molars, no unit's addition from life subject material physical. In more meaning narrow, that is, at the level of psychological, that is the unit of life, which mediated by reflection psychic, the function actually is direct subject to world objective. With say other, activity not reaction and no totality reaction butsomething system that has structure, transition and transformation internal alone, progress himself (Leont'ev, 1978).

Activities are carried out in response to the specific needs of the subject (Leont'ev, 1981). This need stands behind the activity *motive.* The main thing that

distinguishes one Activity with activity other is difference the motive (Leont'ev, 1978). Student to do duty mathematics which same, one with understanding mathematics which involved as motive, which other with motive pass subject, involved in Activity which different. Activity depends on possibility subject for improve quality life. Needs could be represented in two methods different; *be objectified* or not objective (Captelin & Nardi, 2009). Unobjectified need is needs which no relate with object certain. Thing this cause excitement which stimulate search object which satisfy him. Subject possible experience inconveniences but no could direct behavior to direction something which special which will satisfying his needs. However, when needs fulfilled, needs that changed. It combined with object; by because that objectified. Since moment that, object Becomes motive. Needs stimulate direct subject, and a Activity appear. By because that, objectivity is characteristics which shape Activity which give Activity with a specific purpose. Student need recognize motive they in activity study they. That's the motive appear through action together teacher and student and because that also is product from activity. Student no could recognize motive they alone, and teacher no could give know them (Roth & Radford, 2011).

Literacy mathematics important for understand and involved in public. In thing this, teacher have role important in facilitate involvement student in Activity with develop literacy mathematics as motive. The question is Activity where which conducted student, and by because that, motive what which they take and Chase (Roth & Radford, 2011). I want to knowing what is Activity this related with literacy mathematics. For learn Activity, somebody must learn *action.* Action is what which translate Activity becomes reality (Leont'ev, 1981). This is what which our do by aware when our participate in Activity. Activity man no there is except as action or chain action (Leont'ev, 1978). They is steps which on finally could produce achievement motive. Something action bow down on achievement destination which realized. Goal is results direct which must achieved if subject involved in Activity which will satisfying the motive. By because that, destination related with motive but no same with that. A number of destination and action which different could relate with Activity which same and motive. For example, if motive student is for come on stage on level which satisfying, or more good, in mathematics, one goal is for graduated all test mathematics during year teachings. Action a student which related with destination the could in the form of memorization rule and procedure

mathematics. Action student other possible directed for develop understanding of connection mathematical.

The actions are different but related to the same motive. Therefore, which direction to aimaction directed framed by individual (Roth & Lee, 2007). Action doesn't just exist; they have to do (Roth, 2012).Method for complete action called *operation* (Leont'ev, 1978). Operation is process routine, action automatic. For example, in learn procedure mathematics,holding a pen or writing numbers goes unnoticed. The focus is on producing algorithm and get the correct answer. The operation is only performed because of the directed at the goal of needing it. Therefore, the operations do not serve their purpose itself but adapts the action to *the conditions* under which the goal is achieved. Conditions can be opportunity and constraint physical and psychological (that is, tool which could accessed).

Initially, every operation appears as action, bow down on destination. It actions are gradually internalized and incorporated into other actions (Huang & Lin, 2013). Action becomes the method to achieve the goal. For example, a student studying solve equations initially solve different equations to train skills. Later, student could use method this, for example in tasks solving problem. Student which literate mathematics could use mathematics in various context.

This means that conditions change, and students must recognize which operations to perform conducted. Operations can turn into actions, for example when operations fail to producedesired outcome and the individual reflects on the reasons for failure and how it could be solved (Captelin & Nardi, 2009). Student which literate mathematics involved in reflection sort of that. From draft which outlined in above, Activity can be represented as hierarchical structure in three layers: Activity motive, goal/action, and operation/condition. Structure Activity hierarchies can be visualized, as presented in Figure 1. Like As shown in the discussion above, the three layers are interrelated and explain connection which no inseparable Among subject and Activities (Roth & Radford, 2011).
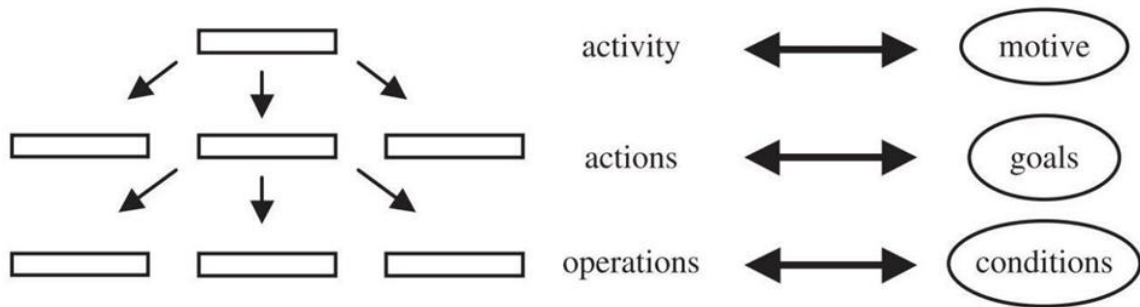
Figure1. Visualization Structure Hierarchy Activity

Vygotsky (1978) consider speech/language same importance with action in reach something destination. Speech working as tool in completing the task and plan solution before carry it out. With thereby, speech/language which differentiate use tool by man with animals. Besides that, speech/language, in meaning say and sign, important as a means contact social with people other. By because that, speech/language have function intrapersonal and interpersonal.

Follow Vygotsky, Leont'ev consider tools have impact fundamental on thought (Captellins & Nardi, 2009). By learning how use tool, integrate it in activity, as well as structure tool that alone, we get great experience accumulated in culture. Tools too important to understand sign role and symbols, and to concept development. Tool could working as the embodiment of the concept abstract based on process generalization individual and collective. Use tool for destination certain, for example, when k to cut down a tree could lead to generalizations of experience using tools.

Somebody could compare ax with deep tree violence thing and tenderness, and also compare cut down tree with another way. I see work for develop literacy mathematics related close with motive, destination and condition. Math knowledge student must "make ends meet" Their life moment this and time front (OECD, 2018). Activity, action, and operation which involve student must reflect how mathematics relate with "world real", and how math learned in school is useful in life daily students . With analyze Activities, actions, and operations, and connect it with literacy math, i could understand how teachers and students work for develop literacy mathematics and is this is motive which prioritized.

Theory Objectification (TO)

Based on creation Vygotsky and Leont'ev, Luis Radford has develop theory objectivity knowledge1(TO). TO focus on how student and teacher produce knowledge with background behindhistory and culture, and how they together produce self they as eye lesson on generally and eye lesson in education on specifically.

TO is written in the understanding of mathematics education as a political, social, historical, and culture. Such efforts aim at creating a dialectic of subjects reflexive and ethical which by critical position self they in practices mathematics historically and culturally shaped, and reflect on and consider the possibilities new action and thinking (Radford, 2016). TO is theory which coherent from teaching and learning mathematics. Theory study teach differ from one another in their conceptions of the content to be studied, the learner, and how learning occur. View constructivist looking at student as constructor his knowledge alone.

According to the objectification theory of knowledge, learning does not consist in constructing or reconstruct a piece knowledge. This is problem give meaning by active and imaginative object conceptual which found student in the culture (Radford, 2008, Thing. 223) . According to Radford (2008), learning mathematics often reduced Becomes simply get draft certain, and knowledge Becomes sort of commodity. However, knowledge not something which can "owned" or "achieved".

Knowledge character general and fickle. "Knowledge is ensemble from process reflection and action which realized by culture and historical" (Radford, 2013). In TO, knowledge involve *possibility* and *actuality*. Object from knowledge have potency for To do something. Potency this is interpretation or action abstract or general which generated from method think and Act culture and history (Radford, 2015a). Also, object knowledge could actualized through something which concrete andreal. For example, knowledge, in theory objectification, definition *objectification* and *subjectivity* have meaning special.

Important for noted that definition which same have meaning which different when used in discourse other, like Sfard (2008). Arithmetic calculations are a possibility. This is a way of thinking that is formed culture about numbers. In performing certain arithmetic calculations, knowledge arithmetic calculations are actualized in a single instance. However, Radford (2015a) states, the singular is not a symbol in itself, but

an embodied action and thought, symbolic, and discursive which required in complete calculation arithmetic. In form single, knowledge appear as concrete and abstract by together.

Activity is what makes the move from potentiality to actuality. Knowledge need determination in form problem posing and activity problem solving which specific for becomes object thinking and interpretation. By because that, object knowledge mediated by Activity. Instead, Activity, Radford, in his works which more new, use idea *work together.* This is for avoid confusion about what which meant with Activity. Work together is form social from effort together in where man involve self by active in world.

They produce to meet their needs that occur in social processes, and at the same time, they produce themselves. Joint work involves matter, body, movement, action, rhythm, passion, language, sign, and thought (Radford, 2018). In teaching and learning in class, draft work together involve understanding teacher and student as involved in Activity which same. Teacher and student work same, for example going to production of a certain way of thinking about numbers. In this dissertation, I will continue to use term Activity.

In TO, learning conceptualized as results from *process objectification.* That is, the objective knowledge of culture is transformed into an object of consciousness (Radford, 2013). Consciousness is considered a subjective reflection of the external world and is a product of relationships and the emerging contingent and historical-cultural mediation. It is a subjective process through which our each as individual reflect. Awareness Keep going continuously appear and changed through process objectification.

Process objectification is process social and collective for Becomes aware will system thinking and action culture and history. Process the occur through Activity. Radford use metaphor *meeting.* Objectification is meeting our with knowledge which there is in culture our. Encounter us with systems of cultural and historical thought occur gradually and without end. By because it, study perceived as something which no once truly end (Radford, 2018). For learning to occur, the realms of the possible and the virtual must be appears in a tangible form in the consciousness of students. This in turn requires that the general be mediated by the particular specific activities

which make which general appear in world concrete, for blessed with specific conceptual content. If what is common is a form of thinking by algebra about line, so which special is Activity which require teacher and student for involved in a number of type reflection andaction which showing content conceptual algebra target, so that generalfinds itself embodied in the resulting singular perhaps even with method which new (Radford, 2013).

Knowing is the instantiation or actualization of knowledge. Therefore, knowing is the relationship between general knowledge, knowledge actualization, and result knowledge updating. Knowing, therefore, the conceptual content concrete ways in which knowledge is used. This is the mode of cognition and form knowledge that frames the scope of concepts that can be produced in certain times in certain cultures. Knowing is what is captured from single concept, which has become the object of consciousness during joint work. System dynamic from potency, Activity, actuality, and knowledge illustrated on figure 2 .
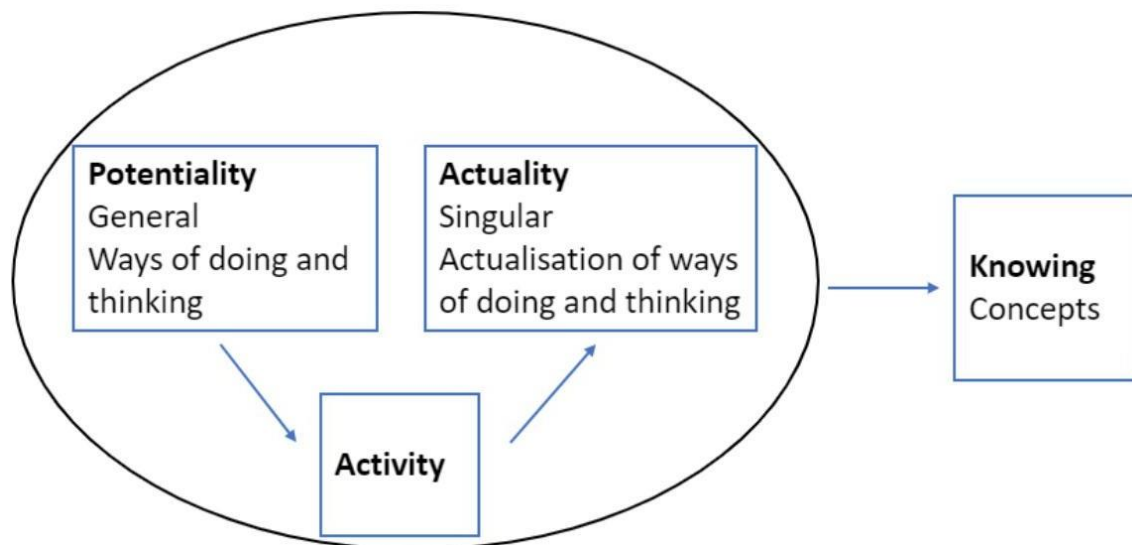

Figure 2. Knowing as what the individual grasps in realization or actualization knowledge through Activity. Adapted from Radford (2015a, p.140).

Based on statements previously, Activity characterized by the motive. Motive activity class mathematics possible meeting with math literacy. Because student possible no realize motive Activity, teacher could introduce destination related. Task special introduced for reach destination this. Task Activity in accordance with action in

scheme Leont'ev (see Picture 1). In TO, structure motive-objective-task is part central from design Activity class. This in accordance with arrow left on Picture 2, from potency to Activity. Structure motive-objective-task illustrated on Picture 3. According to Radford (2015b), arrow left refers to on intention pedagogical activity class, with say other, design activity.

The design involve analysis epistemological from content mathematics target and reflection about how things possible occur in class. However, like which possible experienced by many educator, person no will once know how things could occurin in class. Arrow middle, from Activity to actuality, on Picture 2 shows actualization Specific from knowledge which generated by Activity. This refers to on how things actually changed, implementation activity in class. In interpretation I, this involve level operation/condition Leont'ev.

Actualization knowledge is process which appear, which means that class understood as system which develop. Evolution system depends on how teacher and student involved in Activity and no could determined previously.
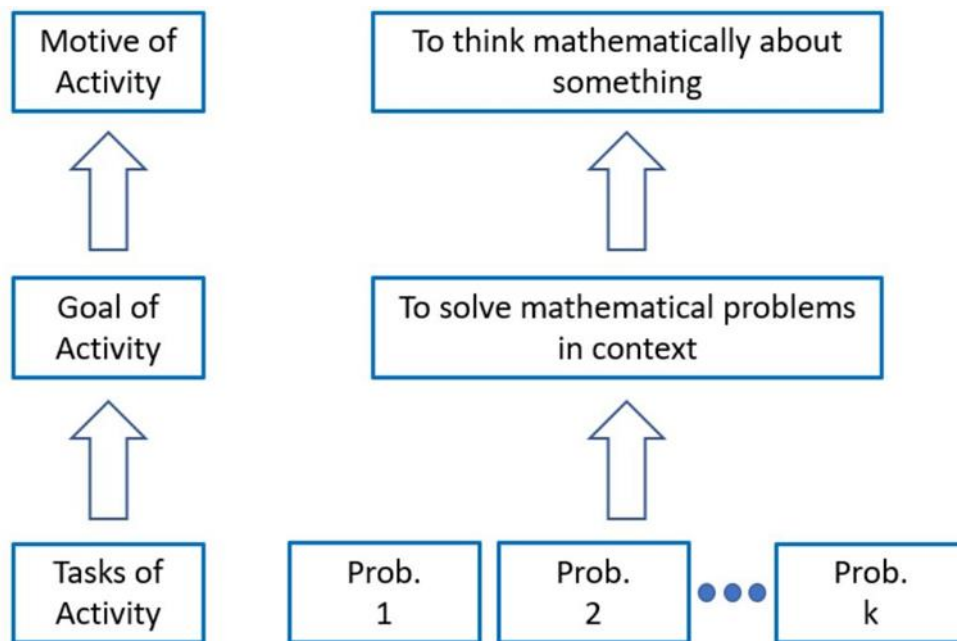

Figure 3. Structure motive-objective-task. Adapted from Radford (2015b, p. 555).

In term TO, study interpreted as results from process objectification. Room class no only produce knowledge; they also produce subjectivity. here which called by Radford as *process subjectivity.* Process subjectivity is "process in where, together produce self they alone with background behind culture and history, teacher and student

present" (Radford, 2018, p. 140). By because that, study also about becomes. Somebody experience subjectivity in every Activity which followed during day, week, or month. School, life personal, life work, and life public including in various form Activity. During activity this, person the keep going changed and becomes more knowledgeable. This related with how TO consider emotion and thinking. In TO, emotion and thinking considered as part from nature man.Study involve thinking and emotion which influence our as man. By because of that, when we study, we also " become " there " . Radford (2015a) state that there is connection dialectical among knowing and becomes. We becomes because our knowing, and our knowing because our be .

Connect chat, TO with literacy mathematics

During a day, somebody participate in a number of system Activity and participate in realize various motive. Motive different which direct Activity our have level interest which different for individual (Roth, 2014). By because that, motive arranged by hierarchical. Hierarchy this created in system connection social which entered individual through Activity. Motive and the hierarchy shape individual personality. Individual weave together involvement in activity which different and prioritize motive which different. How hierarchy motive formed which shape personality. If motive literacy mathematics have priority low, this Becomes part integral from personality. Literacy mathematics as practice social and seen from CHAT and TO means literacy mathematics is part of one's personality.

Personality and subjectivity describe and theorize about experience someone (Roth, 2014). Literacy mathematics involve use mathematics in various context. This means for interesting experience mathematics from one context for solve problem which other. Experience mathematical originated from Activity which different in where individual involved. When hierarchy motive formed in connection social, meeting individual with literacy mathematics in activity which different influence so far where literacyMathematics is prioritized.

As motive. I propose a conceptualization of mathematical literacy in the concept of TO. I relate the five elements of mathematical literacy to the system illustrated in Figure 2. Therefore, I see mathematical literacy as a type of knowledge certain which required for participate in public. Knowledge this involve potency, activity, and actuality. Potency is knowledge mathematics general and abstract.

Activities are determined by the particular context, the disposition of the participants, and the tools available. Context special tasks and problems faced by students are general actualization in the form of single. Critical orientation is conceptualized as a knowing, conscious, subjective process through which the individual reflects and orients himself in the world. In In this sense, I conceptualize the development of mathematical literacy as process objectification.

Because literacy mathematics involve introduction how information mathematics could used for destination which different in public, development literacy mathematics related close with process subjectification. This about becomes inhabitant country which informed, reflected, and ethical. Model conceptualization literacy mathematics I in draft TO illustrated on Figure 3

Arrow left on Figure 3 illustrate intention pedagogical teacher and planning. Motive activity teacher related with destination certain. Task which different planned for reach destination which satisfying motive. Model Mathematical literacy serves as a tool in planning and organizing tasks Activity, but also for understand literacy mathematics. Elements literacy mathematics can be used as a tool for teaching planning but also a way to understand what that literacy mathematics. Thing this depicted with entry elements in process objectification. By because that, I propose model this as tool for understand, plan, and analyze teaching and learning holistic for literacy mathematics.

CONCLUSION

Knowledge character general and fickle. Knowledge is ensemble from process reflection and action which realized by culture and historical.

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