Adolescents' Endorsement of Narratives Regarding the Importance of Mathematics: A Dialogic Perspective

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Sociocultural accounts of students' identity emphasize the endorsement of narratives about learning from "significant narrators". In contrast, psychological accounts highlight adolescences as a time of separation from parents and other authority figures. In this study, we attempt to reconcile these two views based on the Bakhtinian concepts of Authoritarian discourse and Internally Persuasive discourse. The study examined the mathematical identity narratives of five adolescents, 2nd generation to former Soviet Union immigrants in Israel, participating in a STEM afterschool activity. The report's findings focus on 3 of these students' endorsement of one narrative, "math is important", in both individual interviews and a focus group. The analysis showed that all participants endorsed the narrative and related it to their designated identities. However, participants differed in the level of endorsement of this narrative, ranging from 'full' endorsement to 'oppositional' endorsement.

Keywords: Sociocultural narratives, mathematics identity, adolescents, immigrants.

Rationale and Goal

In recent years, students' mathematical identities have attracted increasing attention (Darragh, 2016; Radovic, Black, Williams, & Salas, 2018). Many of these studies focus on adolescence as a critical time for the development of such mathematical identities (Black et al, 2010; Heyd-Metzuyanim, 2015). Yet historically, adolescence has been treated very differently by psychological and sociocultural (or sociological) accounts of human development. Sociocultural accounts, especially those leaning on structural sociological theories which theorize individuals as products of social structure, assume that the construction of identity narratives draws on narratives authored by "significant others" (e.g. Sfard & Prusak, 2005). In contrast, psychological theories highlight adolescence as a time where individuals construct their unique identity in separation from the adults around them (e.g. Blos, 1967). This disparity, between studies that point to adolescence as a time of separation vs. studies assuming the adoption of socioculturally based narratives into one's identity, invites a closer examination of the endorsement and separation processes of students' mathematical identity. Hence, this report aims to investigate this duality of endorsement and separation in the case of three adolescents who belong to a minority community of former Soviet Union immigrants in Israel.

Theoretical framework

The concept of identity has been notoriously ambiguous and difficult to define (Radovic et al., 2018; Sfard & Prusak, 2005). To answer this ambiguity, Sfard and Prusak (2005) suggested an operational definition of identity as "narratives about individuals that are reifying, endorsable and significant" (p. 16). They differentiated between actual (or current) identities, namely stories about the current state of affairs, and *designated identities* – stories of what is expected to be the case in the future, stating that learning resides in the gap between current and designated identities. Black and colleagues (2010) pointed to the importance of vocational aspirations and their connection to mathematics in relation to

adolescents' designated identities. Sfard and Prusak also distinguished between 1st person (1st P) identity stories (narrative told by the author about him/herself), 2nd P and 3rd P stories (narratives told by others about the protagonist, to him/her or to others respectively). They, as well as Heyd-Metzuyanim (2015), showed how 3rd P identity stories of significant narrators turn over time into 1st P identity stories.

Despite the operational clarity of Sfard and Prusak's (2005) definition, this definition is unclear regarding the status of narratives about mathematics and learning mathematics, such as "math is hard", "math is about calculations" or "math is important". Such narratives, often related to in the literature as "beliefs about mathematics", play a crucial role in shaping students' relationship with mathematics (Törner, 2014). For this matter, we incorporate into our conceptual framework Holland and her colleagues' (1998) concept of the *space of authorship*. Bakhtin (1981) suggested that a human being is always in a state of addressing different sociocultural voices and *authoring herself* and others. Holland and colleagues (1998) define this space of authorship as a "broad venue, where social languages meet, generically and accentually, semantically and indexically, freighted with the valences of power, position, and privilege" (p. 191). Drawing on these ideas, we conceptualize the *space of authoring mathematics identity* as a dynamic arena containing narratives relating to mathematics, learning mathematics and the person as a mathematics learner.

In order to reconcile the "endorsement vs. separation" conflict between psychological and sociological views of adolescence as a time of identity development, we draw on another Bakhtinian concept: the process of ideological becoming. Bakhtin (1981) conceptualized, from a discursive point of view, the process whereby individuals selectively assimilate others' words. This process begins, according to Bakhtin, with a separation between *authoritarian discourse and internally persuasive discourse.* Authoritarian discourse mostly belongs to parents, teachers, adults and other authoritative social figures. Bakhtin described this discourse as demanding unconditional allegiance and permitting no play with its borders, no arguing or dialogue. However, the words of others, according to Bakhtin, do not have to remain isolated and static; they can be internally persuasive and become "half-ours and half-someone else's" (p. 345). In this process the other's narratives are questioned and challenged. Morson (2004) defined these dialogically tested narratives as *internally persuasive*. Our research question in this study was thus: to what extent are adolescent students' narratives in the Space of Authoring their Mathematical Identity, internally persuasive?

Methodology

The study included five 8th grade students (13-14 years old) that participated in a weekly STEM-oriented afterschool activity at the Technion (hereafter "the Activity"). They all studied in the same school. The study was a pilot study aiming to build conceptual and methodological tools for a future larger study on students' identity in relation to dialogic instruction in mathematics. Hence, we chose this specific population because the students were participating in a STEM activity held in our university and could be easily accessed. The students' age corresponded with the age of our future study's population. Participation in the study was voluntary, and anonymity and confidentiality were guaranteed through an informed consent letter signed by the participants and their parents. Only four cases were analyzed. The four participants were born in Israel, 2nd generation of former Soviet Union

(hereafter: 'Russian') immigrants; the fifth participant was a recent immigrant from Russia. This difference between her and the other participants became known during the data collection stage. Due to her limited ability to communicate in Hebrew, as well as our wish to maintain a cohesive framework of participants who are 2nd generation to Russian immigrants, her data was not analyzed in the study.

The study included semi-structured individual interviews with four participants that preceded one focus group interview with all five participants, all recorded and transcribed. The interviews were conducted by the first author in a separate room. Each individual interview took approximately 45 minutes and included questions intended to elicit current 1st and 3rd current identity and designated identity narratives such as "what subjects are important for you?", "what kind of student are you?", "how would your parents answer that same question?", and "what would you like to be when you grow up?". Since our focus was the dialogic aspect of the endorsement of narratives, the interviewer questioned the participants on the sources of their narratives (e.g. "who says that math is important?") and asked for justifications (e.g. "why is it important?"). The focus group lasted 90 minutes. It began with a discussion of important subjects in school and ended with discussion of participants' wishes for the future. The rationale for holding a focus group in addition to interviews was double. First, there were participants who did not want to participate in the interview but agreed to participate in the focus group. Second, we wanted to observe processes of identity construction and endorsement of narratives from students' space of authorship in a more natural, "conversational" situation, where the voices of different students could meet and be negotiated.

Data analysis consisted of a two-stage analysis. The first stage included searching the whole interview dataset for common endorsed narratives belonging to the participants' Space of Authoring Mathematics Identity as well as current and designated identity narratives and their related narratives. Here, we encountered a difficulty with relation to narratives indicating "separations", since often, narratives authored as "truths" about the world have lost their sociocultural origin. For example, "I am a student" is a narrative that rarely contains evidence of its sociocultural source, although at a certain point in time, the author must have learned from others that this narrative identifies him. For this methodological reason, we chose in our analysis to focus only on those narratives that included indications of sociocultural sources. For example, "when I was young, my father told me that art is just a hobby" is a narrative ("art is a hobby") where the identified sociocultural source is the "father". A narrative was categorized as *endorsed* if the participant voiced the narrative, at least in part, in her own voiced or agreed with the narrative voiced by others (interviewer or peers).

The second stage analysis included a close-up examination of the dialogical aspect of the narrative's endorsement. Narratives which were voiced as solely coming from an authoritative voice (for example "my parents say that…") were categorized as *Authoritative*. Signs of separation of the participant's voice from the voice of the source were derived from positioning statements that included the opinion or thoughts of the "I" in relation to the narrative. For example, "my mother thinks art is a hobby, **but I** would like to pursue it". If signs of separation were identified, we further searched for signs of *internally persuasive endorsement*. These can appear in the form of providing justifications for the narrative, such as "art is a hobby because you cannot earn money with it". We further examined those justifications as "sub-narratives" along the same line to determine if those

sub-narratives were themselves internally persuasive. Endorsed narratives, along with their justifications and sub-narratives were compared and related to students' designated identities. For reliability, we employed a consensual coding process based on both authors' mutual agreement.

Results

For the purpose of this report, out of the four cases, we chose the three cases of Benny, Sonia and Denis, which could best exemplify the different levels of endorsement in relation to the same narrative, "math is important". The forth participant showed a level of endorsement similar to Benny. The overall results included the examination of other endorsed narratives related to the participants' designated identities such as "art is just a hobby" and "I need these studies". The narrative, "math is important" was stated by all students during the interviews as a response to the interviewer question "which (school) subjects are important?"

Benny's case – full endorsement

Benny participated only in the focus group, since at the time of individual interviews, he did not yet volunteer to participate in the study. In the focus group, after several students talked about the importance of different subjects, the interviewer (1st author) turned to Benny and asked: "Benny, what do you think, because I think you also said math (is important)". To this, Benny answered:

> It's very important, like if you want to get accepted for the good jobs that you have regular hours and all that ... you must understand mathematics well, otherwise you get stuck in hard jobs where you break your back to get a few shekels.

Notably, these claims were authored in his own voice, as facts about the world, even though some of them (such as those relating to jobs with "good hours" in contrast to jobs "where you break your back") most probably were authored by adults around him. We base this interpretation on our acquaintance with students of Benny's age and social position who rarely have direct access to different jobs' "hours", their "regularity" and the exact physical activities that are entailed by them. Although we interpret these narratives as sourcing from the sociocultural world, the way they are authored by Benny completely hides their sociocultural origin. By that, Benny shows full separation from the sociocultural origins of this narrative; it is not related by him in any way to what his parents or other authority figures say.

In relation to his designated identity, Benny talked about his wish to become a surgeon and said he would have liked to study the subject of surgery in school and in the Activity. When asked what in the Activity was relevant to his wish to become a surgeon, he asserted: "math is always relevant" and elaborated this claim with the following justifications:

> In many ways (math is important) ... measurements... say you are doing a cardiac surgery, then it is important, say, how long you have between transferring the heart, between the body from which you are taking out the heart until he gets another heart and how long it... a lot to calculate...

We see here that Benny links his designated identity as a surgeon to the narrative "math is important" and describes specific future situations as a surgeon in which he could find himself using math. Although some of the relations Benny made between the job of a surgeon and mathematics do not actually fit the place of mathematics in the surgery world, it is clear that Benny uses his conceptions

of mathematics (as mostly calculations) to link to what he imagines the world of surgery to be. Since there is no mention of anyone who told Benny about this relation of surgery and mathematics, and since the connections themselves are a bit constrained and indicative of Benny's own yet limited grasp of what mathematics (and surgery) is all about, we categorize the endorsement of this narrative as internally persuasive. In no place does Benny offer conflicting narratives to the narrative "math is important" (neither in his own voice nor in revoicing someone else's voice), thus strengthening our identification of his discourse about the importance of mathematics as full endorsement.

Sonia's case – conflictual endorsement

In her interview, Sonia reported liking best the subject of art and sports. Despite that, and similarly to the other participants, she claimed both in her individual interview and in the focus group, that math and English are the most important subjects studied at school, thus providing evidence of endorsement of the narrative.

When the interviewer asked her why it is so, Sonia replied:

> First, (they[1]) say it is most important, and also, like, it's needed…it's also a very very important part of the Bagrut[2]…(they) always say that most important are math and English... I also think English is important.

The interviewer then asked again why math is important, after which the following exchange took place:

(implied words), [overlapping speech]

45	Sonia:	(They) say, I still don't understand why… But (they) say math is important... okay... [fine…]
46	Interviewer:	[Who says? Who says?]
47	Sonia:	The parents say. Like, for my mother all subjects matter, no matter which one, but like almost all people say that... English and math, I still don't understand why math. I want someone to explain it to me, why?
48	Interviewer	Because what? Because you don't find in it anything to do with...?
49	Sonia	Like, it's important in engineering and all that... I don't know... maybe because I don't really like the subject

Excerpt 1

In line 47, Sonia specifies the identity of the source to be her parents and "almost all people". There are clear signs of separation between her own voice ("**I** still don't understand why math" [47]) and her parents' voice ("The parents say" [47]). We thus see Sonia's endorsement of the narrative "math

[1] In literal translation the word "they" would be omitted. The omitting of "they" is often used to avoid the passive voice in Hebrew.

[2] Israel's high school matriculation examination.

is important" as conflictual. Although she claimed not to have internally persuasive reasons for the narrative and even challenged the interviewer to provide her with justifications, Sonia did initially author the narrative as her own (in answering the interviewer's question which subject was most important at school), as well as provided a reason: engineering (49). The mentioning of engineering as a reason for the importance of mathematics was related to Sonia's designated identity. She said: "I already have one idea for what I want to go study… software engineer". When asked why she wants to study software engineering, she said:

> …I really like computer games and I want to do software for computer games, and also actually in my opinion I think that the fact that I like drawing and with all the thoughts and fantasy, it will help me in computer games to invent something interesting.

Although in her interview Sonia mentioned the plan to be a software engineer as her own idea, two weeks later, in the focus group interview, she said, "My mother wanted me to be a software engineer. For that I need five math units[3]…" Despite the identification of her mother as the source of her future plans, Sonia displayed in her justifications an internally persuasive endorsement of her reason for studying mathematics (studying engineering). Thus, like Benny, Sonia links her designated identity (as a software engineer) to the endorsement of the narrative. However, she also poses conflicting narratives doubting this narrative and confirming its authoritative nature. To summarize, Sonia's endorsement of the narrative "math is important" is double-voiced and conflictual, showing signs of internally persuasive discourse together with authoritarian discourse.

Denis's case –oppositional endorsement

In his individual interview Denis reported he liked computer games and sports, and that he wants to have "two degrees" and study in the "biggest university". Both in the individual interview and in the focus group interview Denis listed exact sciences (including math) as most important. When the interviewer asked why, Denis cited his mother "because she always has this thing with numbers", thus identifying his mother as the source for the narrative. In the focus group, when the subject of why math is important was raised, Denis said:

> a. Because the parents force you; b. Because they came from the Soviet Union and for them math is in the blood; c. Because we are in Israel and (you) don't earn much in Israel

This claim was consistent with Denis's claim in his individual interview that 'Russian' parents try harder to teach their children math at home:

> because they want the children to come out smart in the country... and Israel for them is not an easy country, not a lot of money, problems, they want their children to come out lawyers and doctors… geniuses...

He then added that, as their (the 'Russians') child, you need to "make as much effort as possible to impress the parents at the end of the year to show them the report card". Examining the endorsement of the narrative "math is important", it is clear that Denis separates his own voice from the identified

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[3] The matriculation exams in Israel have different level of "units". The most advanced level is "5 units".

source by positioning himself as being coerced to study hard and earn high grades because of his immigrant community. Thus, implicit in Denis words, is a narrative that in fact opposes the narrative "math is important", a narrative that could be explicated as *there are no relevant reasons for me to study mathematics aside from pleasing my parents*. The justifications to the narrative provided by Denis are all related to the source (his mother and other 'Russians') and thus cannot be categorized as internally persuasive. The links Denis makes between designated identities and the endorsement of the narrative are all related to 3rd P designated identities, that is, what others expect him to become. We thus label Denis's endorsement as oppositional.

Discussion

This study sheds light on the process by which narratives in the Space of Authoring Mathematics Identities, originating in sociocultural voices, are endorsed and incorporated into adolescent students' 1st P identities. In addition, it highlights the connection of narratives such as "math is important" to students' designated identities. We see this in the fact that Denis, whose endorsement of the narrative was oppositional, connected the "math is important" narrative to his future ability to earn money without specifying how this narrative would be relevant to his designated identity. In contrast, Sonia and Benny (whose wishes were to become a surgeon and a software engineer) related the importance of mathematics specifically to their future desired careers. This link between narratives in the Space of Authoring Mathematics Identity and designated identities reinforces Black and colleagues' (2010) suggestion that motives, derived from students' aspiration, may play a crucial role in shaping their relationship with mathematics. In other words, although narratives about the importance of mathematics circulate around students, the answer to whether these narratives would turn from authoritative discourse to internally persuasive discourse may lie in the connection of these narratives to students' plans and aspirations for the future.

Rather than assuming a relatively straightforward adoption of narratives authored in the sociocultural sphere as some structural sociological accounts do, the present study examined the dialogic process of endorsement, based on the Bakhtinian concepts of authoritative discourse and internally persuasive discourse. Although in all three cases reported herein there were indications of sociocultural sources to the narrative "math is important", these cases showed different degrees of *separation* of the adolescents' voice from the voices of significant narrators around them. This exemplifies the process by which narratives authored by significant others are not simply "facsimiled", in the words of Holland et al. (1998) onto their children's identity. Moreover, the endorsement of the narrative by the three adolescents was different in subtle yet noticeable ways. The analysis revealed three levels of endorsement of the narrative: full endorsement, conflictual endorsement, and oppositional endorsement. Full endorsement was established by signs of an internally persuasive discourse regarding the narrative; conflictual endorsement was established by evidence of both authoritative discourse as well as internally persuasive discourse; and oppositional endorsement was established by signs of an authoritative discourse. These findings suggest that students' endorsement of narratives in the space of authorship is a complex process. The fact that a student states for example that "math is important", and even cites his parents or author authority figures as the source of this narrative, does not provide the whole picture regarding the endorsement of the narrative and the separation of the adolescent from the authoritative discourse.

Although we present a small-scale study and our report focuses on one narrative only, our findings foreground the need to use dialogical concepts and tools when examining students' mathematical identities. Furthermore, the theoretical approach we adopted in this study goes some way in mediating between psychological approaches emphasizing adolescence as a critical time of separation from authoritative figures, and sociocultural approaches signifying the importance of narratives surrounding the students. By this, the study contributes to bridging the gap between studies taking a psychological approach to identity and studies taking a sociological, discursive take on this concept.

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