

# DIALOGIC AND NON-DIALOGIC ACTS IN LEARNING MATHEMATICS

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Dialogue has been characterised as a communicative pattern that may support ‘critical learning’ (Freire 1972). Alrø and Skovsmose (2004) point out that during a dialogue a diversity of *dialogic acts* may occur. They also emphasise that dialogue is a fragile process, which can degenerate into other patterns of communication. We want here to build on the notion of dialogic act as developed by Alrø and Skovsmose and elaborate on the notion of *non-dialogic act*. We aim at understanding and conceptualising non-dialogical acts and their relationships with students’ participation in mathematical activities. Our identification of non-dialogic acts refers to episodes in mathematics classrooms; however, we do not claim that such acts only occur in mathematics. Quite the contrary, we believe that such acts might be observed in any conversation.

Our analysis offers a new theoretical basis for analysing interactive processes that constitute learning of mathematics. We point out communicative acts that might support dialogic processes, as well as acts that might obstruct them. We find that any process of communication is composed of many such acts. We should not think of any such process as being ‘pure’ dialogical, but as a constant tension between dialogic and non-dialogic features.

## Dialogue and learning

Connections between communicative processes and the learning of mathematics have been explored since antiquity. Plato’s dialogue *Meno* captures the communication between Socrates and the slave of Meno, who comes to understand some mathematical properties. Many attempts have been made to investigate the relationships between learning and dialogue. Alrø and Skovsmose (2004) highlight three features of a dialogue: making an investigation; running a risk, and maintaining equality. We base our analysis on this characterisation, although we make some modifications in terminology.

Highlighting the feature of *investigation* serves the purpose of putting aside some of the many ways the notion of dialogue can be used, such as: ‘The dialogue between Russia and the USA includes tensions’ and ‘The dialogue in the film *Godfather* is well written’. By highlighting ‘investigation’, the notion of dialogue is related more directly to an educational context.

Dialogue also includes *running a risk*. During a dialogic process, teachers take risks by creating opportunities for students to find their own route through a mathematical investigation. Simultaneously, students take risks by sharing their preliminary ideas with other students. The very notion

of risk includes some negative connotations, suggesting that one should try to avoid running the risk. However, risks related to dialogue also include new, unexpected and potentially fruitful opportunities.

Finally, dialogue means *maintaining equality*. We prefer, however, to talk about *equity*, as this notion has been developed to include many more aspects than the classic philosophic interpretation of equality. In the contexts of the classroom, students and teachers are in different positions of power, for instance with respect to responsibility, obligations, and knowledge. Such differences can impact on the power structures in teacher-student interactions. Still it is possible to talk about a dialogue between teachers and students, if these differences in positions do not define the course of the communication. This is the idea of highlighting the feature of equity and the relevance of teachers and students constructing equity in the mathematics classroom (see Skovsmose, in press).

The notions that are used—investigation, unpredictability and equity—are just as complex as the very notion of dialogue itself. Therefore, it is important to try to be more specific in characterising a dialogue.

## Dialogic acts

The need for specification brings Alrø and Skovsmose (2004) to make a further attempt in characterising dialogue. This attempt is based on the conception of *dialogic acts*, a conception that can be related to the notion of *speech act*, which has been elaborated by John Searle (1969).

When we consider Searle’s characteristics of a speech act, one might come to think of such acts as being individual. Speech acts are performed by the speaker, who might make a warning, give a promise, or make a joke. Dialogic acts can be seen as, not individual, but as collective acts. They can be seen as forms of *inter-acts*.

In the interaction between teachers and students, and amongst students, Alrø and Skovsmose identify eight dialogic acts, namely: getting in contact, locating, identifying, advocating, thinking aloud, reformulating, challenging, and evaluating.

*Getting in contact* refers to the act of preparing the ground for a dialogue: participants need to pay attention to each other. This act is also important during the dialogical process where, for instance, students complete and supplement the statements made by others, and this way shows that they are actively listening and paying attention to what is said. *Locating* means expressing perspectives on how to approach a particular issue. Different perspectives may be presented,

and locating refers, for instance, to the initial approach of finding out what could be done for completing a certain mathematical task. *Identifying* includes a further clarification. It could, for instance, involve the identification of mathematical ideas or notions that could be used for completing the task. *Advocating* means presenting arguments to defend a perspective. With reference to mathematics, one can think of advocating as processes of proving a mathematical statement. *Thinking aloud* can be understood as making public ideas that emerge during an investigative process. Much thinking aloud takes place in front of the blackboard or in front of the computer screen, where one can point, show, and illustrate what one is trying to say. *Reformulating* means restating something in a different way, using different words, another tone of voice. For instance, if a student points out that there seems to be a connection between two variables, another student may say, ‘Ah, you think they are proportional.’ *Challenging* means asking questions that allow the other to change perspective. The question ‘Do you really think it is possible to do the calculations this way?’ might lead to a change of strategy. *Evaluating* includes reflection on the investigative process, on the perspectives presented, and on the form of the collaboration in the group.

Based on the characterisation of dialogic acts, one can reach the following definition: *A dialogue is a communicative process that includes several of the described dialogic acts.* This means that the definition of dialogue can be related to phenomena that can be observed, namely dialogic acts.

Alrø and Skovsmose also point out that dialogic acts are fragile and that it is possible to observe “that such acts switch into other patterns of communication that can hardly be labelled dialogic” (p. 130). This observation brings us to consider acts that obstruct dialogue, and we refer to such acts as *non-dialogic*.

### Non-dialogic acts

A few investigations have considered acts that obstruct dialogue. Andersson and Wagner (2017) highlight that the interaction in the mathematics classroom can be interpreted in terms of love and bullying. According to the authors, the communication “can open or close space for the other and that this impacts students’ experiences of love, bullying, and separateness” (p. 391). This work emphasises the importance of investigating processes of interaction with critical lenses, taking into account both their potentialities and their limitations.

Located within critical mathematics education, Vithal (2002, 2003) points out that schools are part of society in which crises and conflicts are present (this could, for instance, be due to apartheid period in Africa or to the refugee crisis in Europe). Teachers and students are part of this society. Thus, conflicts also emerge in school interactions, both between teachers and students as well as among students. The relationship between dialogue and conflict becomes a fundamental aspect when one seeks to understand interactions in the classroom.

The data we analyse was produced during the doctoral research of the first author (see Faustino, 2018). The data production took place in a Grade 3 and a Grade 5 mathematics class, in a public school in the São Paulo State. During

one semester, the teachers of the two classes developed the project *The Environment and Mathematics (Meio Ambiente e Matemática)*. As part of the research, the classes were audio and video recorded.

During the analysis, we studied the audio and video several times and identified critical events. In the context of this article, critical events are constituted by events that allow the identification of particular communicative patterns. Once such events were identified, they were transcribed and analysed. During this process, we identified a diversity of dialogical acts, both in the interactions between teachers and students and among students. However, we also found some acts that did not fit the characteristics of being dialogic. Apparently, a dialogic process can degenerate into other communicative patterns. We related this degeneration to the occurrence of some acts that interrupted the dialogue. We call these acts ‘non-dialogic’.

Naturally, one could try to identify non-dialogic acts by ‘reversing’ the dialogic acts as referred to previously. Thus, the dialogic act ‘getting in contact’ could bring us to describe the non-dialogic act of ‘confronting’. However, we will use a different strategy for identifying non-dialogic acts. We will refer to *episodes*, which include many dialogic acts, and in this sense can be characterised as dialogue. Within these episodes, however, we will identify particular apparently non-dialogical acts.

### First episode: My elbow is hurting!

As part of the project *The Environment and Mathematics*, the Grade 3 students were presented with the task of estimating the height of an actual size cardboard cutout of a baby giraffe. The giraffe was leaning against the wall in the front of the classroom. The students were divided in groups, and the group composed of João, Letícia, Luan and Isis engaged in the following conversation (all names are pseudonyms). Two teachers were involved: ‘Teacher’, the regular classroom teacher, and ‘Teacher Fernanda’, the special education teacher. Luan estimated the height of the baby giraffe to be three meters tall and offered an argument.

*Luan* Teacher Fernanda is tall. She is more than one meter tall and the giraffe is taller than her. So, I think it must be three meters tall.

But João made an objection, which he addressed to the teacher.

*João* He is saying it is three meters tall and the three of us are saying it is two meters tall.

However, Letícia seemed to disagree with João.

*Letícia* One meter and a half [pause]

*Luan* One meter and [pause]

*Isis* Two meters.

*Luan* One meter. One meter and ninety-nine centimetres.

Suddenly, Luan got up and went to another group that was also comparing the teacher’s height with the height of the giraffe. Based on the conversation, it is not clear why Luan

left the group. It could be that he felt the others ignored his suggestion of comparing the giraffe with the teacher. Leticia, Isis and João looked at one other, and then continued the conversation.

*Isis* Look at the Teacher's height. Look at her height and look at the height of the giraffe. The giraffe seems to be one meter taller. It is one meter taller.

*Leticia* Then it is two meters, Isis. Write it down!

Leticia talked in a loud, almost commanding voice. Isis did as she was told, and then she addressed the teacher.

*Isis* Teacher, the three of us are saying that the giraffe is two meters tall and Luan is saying it is three meters. So, we won.

The teacher came to the group.

*Teacher* Where is Luan?

*Isis* He is there asking something to teacher Fernanda.

Isis made this remark as an aside to another group. Leticia then recapitulated Luan's initial suggestion that the giraffe was three meters.

*Leticia* Teacher, three meters is the height of an adult giraffe, and not the height of a baby giraffe when it is born.

Isis had made a note of the two meters on the group's working sheet. The teacher took a look at Isis's note and asked her to justify the answer.

*Teacher* Why do you think it is two meters tall? Look at the giraffe there. Where did you get the number from?

*Leticia* Because it is higher than a meter.

*Teacher* Why is it higher than a meter?

Luan had returned from the other group and was sitting with his shoulder turned towards the group looking downwards. Then he complained.

*Luan* My elbow is hurting!

The teacher and the students ignored this comment, but Luan insisted.

*Luan* Teacher, my elbow is hurting. Teacher, teacher, my elbow is hurting. Do you know why? Because I tried a skateboarding manoeuvre. Right, teacher? So I fell off my skateboard, banged my elbow on the wall.

The teacher also ignored his comment. She did not look at Luan, but concentrated on estimating the height of the giraffe.

*Teacher* Why did you say two meters? Because it is taller than one. You said that. What else? How did you get to two?

Initially, the group did not try to find out what Luan had in mind. At first, he suggested that the baby giraffe was three

meters tall, then he changed to 1.99 meters. But why he made these different estimations was not clarified. Luan then moved to another group that was discussing an approach that might be similar to his.

We can say that when realising that his perspective would not be selected, the student Luan left the group and, for a moment, went to join the discussion in another group. In other words, the intentionality of the student left the activity, an aspect termed by Alrø and Skovsmose (2004) 'zooming-out'. This is related to the complexity of keeping the whole class engaged in dialogue. Thus, although everyone has accepted the teacher's invitation and engaged in dialogue, including student Luan, during the interactions between the teacher and the students, there may be some reasons for students' intentionality to leave learning. And this aspect is configured in a daily challenge in the process of dialoguing in the classrooms of the early years.

Isis says, "we won" turning the dialogue into a competition. For her, one of the two perspectives presented in the group had been successful because it was selected to be written on the activity sheet. It can be said that children, at some moments of interaction, associate the perspective that would be followed as a winning perspective and one that would not be followed as the losing perspective. According to Bohm (1996), dialogue is not intended to be won. Everyone wins if there are no winners. Participants in dialogues have to be open so that their perspectives can be questioned by the other members of the group. The purpose of dialogue is to share opinions, listen to each other and suspend opinions; thus, together, everyone can look at them sharing meanings and walk in different directions, creating something new that is part of a collective reflection. In this sense, it can be said that children, at some moments of the interaction, may have difficulty suspending perspectives and creating meanings together, creating a climate of competition, in which one perspective is the winner and the rest are all considered losers.

When Luan returned to the group, he tried to interact with the teacher although concerning a quite different issue, "My elbow is hurting!" But she did not respond to him. In this case, we identify the non-dialogic act of *ignoring*. In fact, we can observe various acts of ignoring during this episode. At first Luan was engaged in the conversation, but left as he might have felt ignored. When he returned, he apparently ignored what they were talking about, and talked about his elbow. This remark, in turn, was ignored by the teacher. That the teacher did so can be interpreted as an attempt to maintain the ongoing dialogue and to help students maintain their intentionality in the activity. However, naturally, the teacher could have paid attention to Luan's comments in order to try to bring him back into the conversation. It is important to recognise that in some interactions the teacher's ignoring what has been said by a student can be productive. If a student repeatedly stops talking about the subject of the activity to address other issues, ignoring can help other students to stay focused on the activity. However, when the teacher often ignores the comments of the same student and the same is done by his colleagues, this can have a negative impact on the student's learning process as well as on his engagement in the dialogue in the math classes.

One may ignore a person by not paying attention to what he or she is saying. Ignoring can also take a direct physical form, when, for instance, one turns ones back towards a person. Ignoring can clearly be expressed through body language, as Luan did when he returned.

We could think of misunderstanding as a non-dialogic act; however, misunderstanding is always a possibility, also in the most intensive dialogue. We are not tempted to consider misunderstanding in general to be a non-dialogic act. Rather, what we have in mind is deliberate forms of misunderstanding, which we refer to as *distortions*. A distortion could concern a particular statement, as when Isis told the teacher that Luan says that the height was three meters. Sure, Luan had said three meters, but he had also said that it was 1.99 meters.

We have mentioned *confronting* as a possible non-dialogic act. We can see several forms of confronting in this episode. One case is when Luan leaves the group, it is a way of expressing that he is unsatisfied with the others. He could have tried to formulate his opinion, but he simply leaves. When he returns, he confronts the group by raising a quite different issue.

Humour and irony can create positive and constructive aspects of a dialogue, but irony can also interrupt a dialogue. In fact, several of the dialogic acts we have referred to as, for instance, reformulating can become non-dialogic by being ironic. We might be dealing with an ironic reformation when Isis highlights for the teacher that they estimated the heights of the giraffe to be two meters while Luan found it to be three meters. We cannot make any claim about what Isis in fact had as motive for stating this, but it makes us aware of the format of one more non-dialogic act, namely *ridiculing*.

### Second episode: He does not even know what he is talking about!

During the project *Environment and Mathematics*, the Grade 5 class undertook investigations concerning the use of the water in the city, in the school, and in their houses. One day, the groups were discussing the amount of water used for household activities such as washing dishes, brushing teeth, and toilet flushing. The students were provided with information about the amount of water used each time a toilet was flushed, being 6 litres. Other data, such as the number of people in their families and the number of times each person uses the toilet per day the students had to identify themselves.

The group consisting of Julia, Carla, Denis and Pedro were trying to calculate how much their families spent flushing the toilet.

*Julia* If every time someone flushes the toilet they spend six litres of water each time.

*Carla* If a person goes to the toilet like [pause] let's say three times.

*Julia* Sometimes I go to the toilet five times a day.

Everybody burst into laughter, including Julia. Then she stopped.

*Julia* Oh! That does not matter!

Then Carla suggested they should make a decision, so they could move on.

*Carla* Three times, for example. Let us consider three times as being a day's average [pause]

*Denis* Is it three times eight?

Clearly enough, the number of times a person flushes the toilet has to be multiplied by the number of litres used in a flush.

*Julia* Yeah, but [pause]

*Carla* No. Why do we multiply three by eight?

*Julia* If we have six litres of water for each flush?

*Denis* Six litres of water [pause]

*Julia* Six litres.

*Denis* On each toilet flush

While Denis was talking, he waved his hands and pointed to Julia, who nodded. Apparently, Denis had remembered incorrectly that the amount of water in a flush was eight rather than six litres. This correction being made, some calculations could be completed.

*Julia* A person goes to the toilet three times. So, how are you going to do it?

*Denis* Three times six.

*Julia* So why did you say eight?

*Denis* Because I thought she said eight litres.

*Julia* So, you are going to calculate that [pause] three times six is eighteen.

*Carla* The result is eighteen litres.

Then Carla turned and looked at Pedro, who had been quiet during the whole conversation.

*Carla* Eighteen times six. Pedro, it is six times, isn't it? Are there six people in your house?

*Julia* He does not even know what he is talking about!

Julia was laughing and put her hand to her mouth. Pedro did not say a word. With his hand holding the pencil in front of his mouth, he nodded confirming that there were six people in his family.

*Carla* So, six times eighteen, which is?

We can identify several dialogic acts in this episode, but we can also note that Pedro remained quiet. At a certain moment, Carla addressed him directly, "Eighteen times six. Pedro," and she paused. One could think of Carla's question as an invitation for Pedro to enter the dialogue. It opened a space for him. Naturally, Carla's question could also include an attack, which Julia made explicit, "He does not even know what he is talking about!" By this comment Julia disqualified Pedro completely. She talked negatively about Pedro, and did so in his presence. Pedro just took it in. He was subjected to the non-dialogic act of *disqualifying*.

Disqualifying can influence the students' (dis)engagement in the dialogue, how they interpret their participation in

mathematical activities, and how they understand themselves as a human being capable (or not) of producing mathematical knowledge. Herbel-Eisenmann, Cirillo and Skowroinsk (2009) state, “We often evaluate students on the basis of what they say or what they write. Our judgments can have massive consequences for our students from their self-confidence in their ability to learn the decision whether they get promoted to the next grade.” (p. 107). Evaluations expressed during an interaction can affect the students’ perception of themselves and the way they are perceived by others. We have emphasised that evaluation can contribute to a dialogue; thus we operate explicitly with the dialogic act of evaluating. However, as we have just seen, evaluating can mean disqualifying, which does not contribute to a dialogue.

We consider it important that teachers talk with students about the ways evaluations and feedback can be made, with the aim of engaging all students in a dialogue. In this way, participants in a dialogue gradually learn that evaluations can be made in a constructive and respectful way, and contribute to the co-construction of a dialogical interaction where all students feel safe to share their views and mathematical conjectures as well as their doubts. In an investigative approach, where interaction is based on dialogue and cooperation, it is essential that students learn to make evaluations without disqualifying.

During the process, Pedro was not only disqualified, he was excluded, and we think of *excluding* as a non-dialogic act. We have already identified ignoring as a non-dialogic act. However, we see excluding is being different. While an ignored person is moved to the periphery of attention, an excluded person can be put in the centre. Thus, by Carla’s question, Pedro was moved to the centre of attention, he was not any longer ignored. He could then have been included, but was instead disqualified and excluded by Julia’s remark, “He does not even know what he is talking about!”

In another context, we have addressed different forms of microexclusions (see Faustino, Moura, Silva, Skovsmose & Muzinatti, 2019) which we can consider non-dialogic acts. One form of such exclusions, we have referred to as *stigmatising*, and in the present context, we interpret it as a non-dialogic act. The episodes we have referred to here do not illustrate this format of a non-dialogic act, but it is not difficult to imagine that Pedro could be stigmatised. In general, we find that stigmatising is an act of labelling a person, as for instance being one who ‘knows nothing’. When such a label is applied, the person loses status. It might not appear relevant to listen to what the person is saying. Dialogue assumes equity, while stigmatising establishes hierarchies.

Non-dialogic acts can have a strong impact on students’ (dis)engagement in a dialogue. When students gradually decrease their participation in mathematical activities, they get fewer opportunities for formulating their strategies for solving proposed activities; in this sense, the students can be harmed. However, this disengagement does not only affect the students who disengage, but the whole group, as the group loses in diversity of strategies and mathematical conjectures, that might contribute to the learning of all the students.

So far, in pointing out non-dialogic acts, we have concentrated on episodes from the work of a group. Had we

concentrated on episodes where the teacher is presenting, we might not have found much space for dialogue. The teacher’s presentations play important roles in most classrooms, and we agree that such explanation can be important, even though they hardly can be described as dialogical. Thus we have to be aware of a non-dialogic act, which in fact is common in the school contexts, and which we will refer to as *lecturing*. Lecturing, however, need not be an act of the teacher. In any conversation, we can experience moments where one person assumes the scene, and dominates the discussion by insisting on presenting and maintaining his or her opinion. This phenomenon we also refer to as *lecturing*.

### Summarising

We have referred to the dialogic acts of *getting in contact*, *locating*, *identifying*, *advocating*, *reformulating*, *challenging*, and *evaluating*. We have now identified eight non-dialogic acts namely *ignoring*, *distorting*, *confronting*, *ridiculing*, *disqualifying*, *excluding*, *stigmatising*, and *lecturing*.

We have characterised the acts through one word. Naturally, both dialogic and non-dialogic acts are complex phenomena, which include many elements. Any such acts express positions with respect to power. For instance, one can think of advocating as an act where the power of the argument plays the principal role, while in the act of lecturing the position of people plays the defining role. Thus, while dialogical acts are based on equity, inclusion, valorisation and respect for differences and construction of a positive cultural identity, non-dialogic acts are related to inequality, exclusion, discrimination, establishment of hierarchy based on stereotypes. When unpacking what is included in dialogic and non-dialogic acts, one needs to address issues of power, authority and position.

Let us now summarise the characteristics of the eight non-dialogic acts. *Ignoring* means disregarding, for instance, a comment or a perspective of another. This act can be expressed by, for instance, turning one’s back towards a person. Ignoring can clearly be expressed through body language. *Distorting* can be established through a reformulation, which in fact could be a dialogic act. However, a distortion leaves out, on purpose, an essential part of the argument being reformulated. In addition, distortion could take the form of making a caricature of what has been said. The caricature can be with respect to the content of what is said, but it could also be with respect to how things are said. One could, for instance, through a reformulation make fun of a dialect.

*Confronting* is a most common way of obstructing a dialogue and the aim of the learning. A confrontation could take the form of a direct negation of what has just been said, without presenting attempts of justification. One could also confront a person by talking about something different, and this way indicate that what has been said is without significance. *Ridiculing* can be brutal. While distorting and simplifying first of all concerns the content of a conversation, ridiculing might concern the person participating in the conversation. We have highlighted equity as a particular feature of dialogue. We mentioned that during a dialogue, equity could be constructed. Through non-dialogic acts, equity could be undermined, for instance through ridiculing.

*Disqualifying* means making comments that devalue the perspective of a person. The disqualifying means, for instance, pointing out that the person does not have sufficient knowledge for stating something about the issue in question. Non-dialogic acts like ridiculing or disqualifying can turn into *excluding*. We make a distinction between ignoring and exclusion. While ignoring refers to some moments in a conversation—one ignores a comment made by the person or a perspective advocated by the person—exclusion is of a more profound nature. Exclusion takes place, not during moments, but during periods of time. *Stigmatising* can serve as legitimation for an exclusion. A stigmatisation can take place with reference to gender, race, religion, sexual orientation, special educational needs, home language and social class. Like exclusion, stigmatisation can come to operate across many different contexts and during longer periods. Stigmatising is a profound way of negating equity.

*Lecturing* can be interpreted directly, as referring to a teacher's presentation in a classroom; it can also be understood metaphorically as referring to a situation, where a person during a conversation maintains the word for elaborating particular points of view without considering the actual relevance for the present discussion. Lecturing makes defining part of the school mathematics tradition. It may serve praiseworthy functions. Still, lecturing is a non-dialogic act. It establishes predictability.

When taken together, the 16 communicative acts, being dialogic or non-dialogic, provide a basis for analysing the complexity of the communication in the mathematics classroom. The eight dialogic acts might appear adequate, when we analyse an interaction that in general fits the characteristics of being a dialogue. However, a straightforward and ongoing dialogue is seldom observed. It is more common to observe conversations that at times take the form of a dialogue, but at other times turns non-dialogic. Such fluctuation is common in classroom settings. In order to analyse them, it is important to have available not only conceptions of dialogic-acts, but also of non-dialogic acts.

The identification of both dialogic and non-dialogic acts makes us aware that an apparent dialogic act might obstruct a dialogue, as for instance when a reformulation turns ironic. Simultaneously, we should be aware that a non-dialogic act might serve the continuation of a dialogue, as for instance when the teacher tries to ignore a student, who in fact tries to obstruct an otherwise dialogic interaction.

Dialogue provides one of the possible and rich routes for learning mathematics, and learning to dialogue is a daily process of construction. Teachers and students learn to engage in dialogue. Even though there are a variety of dialogic acts in an interaction between students, they often

interact using both dialogic and non-dialogical acts. In this way, we consider that by being aware of the format of both dialogic and non-dialogic acts, researchers and teachers can contribute to the construction of more profound dialogic relationships in the mathematics classroom, with the aim of improving the quality of teaching and learning interactions.

Being aware of dialogic or non-dialogic acts helps us to analyse more profoundly such processes, and this brings us to recognise the fragility of dialogue. The identification of non-dialogical acts contributes not only to denouncing their presence in mathematical classrooms, but principally to creating possibilities for being transformed.

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