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# Integrative platform based on the mechatronics model for educational technologies focused on competence

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**Abstract.** Mechatronics is a model of transdisciplinary integration, entirely functional, with remarkable results for mankind. The incredible progress that the global economy has taken in the last decades is based on this new approach, the integrative type, which is present at the foundation of mechatronics. This kind of integrative approach is necessary for building a quality education focused on competence. The requirements from the social and economic environment, the needs of the young people who prepare themselves for an active life and the offers of the education providers are still not too interconnected to offer a satisfying education. This is the reason why the efforts to balance the demand, the needs and the offer are essential to ensure a better integration of students into society. Using a transcultural perspective, we can achieve a constructive approach. The education providers, together with the socio-economic environment, establish a clear structure of competence in multiple domains and of the instruments which can assure it. The scientific demarche, in the spirit of this paper approach the, answers the natural questions from the educational process: „Why, How and What do I learn?”.

## 1. Steps towards a knowledge society

### 1.1. Unprecedented challenges

The collaboration between science and technology and the mechatronic integration of technology make possible the biggest and fastest evolution of humanity in the history of technology. The knowledge and its usage are increasing now faster, quantitatively but also qualitatively. More and more people get involved in this process of knowledge development, so it became impossible for a person to keep up with the news or even to get information about the major discoveries in science or in culture.

Generating knowledge is no longer a problem. On the contrary, this is growing fast. Its development is based on the increasing number of students, on the length of studies, the involvement of the private sector and its increasing contribution through technological and social research. The big problems arise when it comes to the management and integration of knowledge, when it is needed to be useful to people, beyond the technological usage. And there cannot be an authentic progress toward the society of knowledge without suitable instruments for its management.

All the recent events in the world, the series of terrorist attacks on all the meridians, shows us that the mankind didn't evolve very fast in the direction of peace, of reciprocal respect and most of the people are not wiser and happier than before. We came into this situation because our perspective about mankind and the way they can be educated remained at a low level of integration and implementation.



We need sustained efforts against these important challenges and these major crises of education, as an instrument of society that ensures the preparation for the future, for the knowledge integration and improvement of education. The experience gained in the technology field, especially in mechatronics allows the possibility of identifying solutions for a better integration and management. So as the effort of those who educate themselves will be lower and in time, their interest and progress will become higher.

### *1.2. Culture and knowledge*

The analyses of the report between culture and knowledge it's not based only on the academic interest, but it is very concrete and important to human's understanding. Culture researchers see in this not only an accumulation of valuable products, but the thing that provides the mental software which people operate with [1]. From this perspective, the culture may be considered a collection of instruments, provided to people, that they acquire in a more or less conscious manner. Knowledge is part of the culture, being a very useful human-made product.

Because of the instruments integration, and because of the fact that we can detach ourselves from culture, we can analyze and change it so the culture itself may be seen as an instrument. As parts of culture, all the big domains of knowledge are instruments: science, philosophy, religion, art, technique and so on. Each of them is useful to reach some purpose. Inside every domain, there are instruments which in turn contain other instruments down to the smallest of them. For example, in the science we have: biology, physics, chemistry etc. In the physics field we have classical mechanics, quantum mechanics, thermodynamics, the electromagnetism, atomic physics etc. In mechanics we have basic principles which help us get solutions for the movement of objects in specific problems. So, we have many levels of instruments integration, based on the context, interactions and the ways of action.

The reason why the culture and values are created is to provide solutions which satisfy the fundamental human, groups or society needs. For example, the moral values of a society are intended to contribute to a better interaction of its members and so to its integration. Knowledge is considered a value, a valuable instrument, because it offers verified solutions. Knowledge brings autonomy, competence (efficiency, structure), etc. to people. Its approach and establishment in a transcultural perspective puts it entirely in the service of people, because otherwise, it gets out of control.

### *1.3. The Features of Mechatronics*

Mechatronics is a cultural product too, but one which has great and concrete results and it distinguishes itself more from others. We mention some specific aspects:

1. Mechatronics is an active instrument, a creative one, not a simple reflection of reality. It's not just a science which acquires theoretical knowledge about something existent, used directly or by other disciplines. It creates new products, very complex ones, with the most diverse applications using the last discoveries from the integrated disciplines.

2. It has a complete integrative character because it integrates in its products all the three aspects of reality: material, energetic and informational. This aspect is extremely important because is the key to success of new technologies. So, the products will be able to have a dynamic, adaptive operating regime, not a strict, imperturbable one. The created systems have smart characteristics that make their usage easy. For example, the cameras of our mobile phones can adjust the focal length and the exposure on their own, so the photos to be clear. If the users want, they can make themselves these adjustments. The device does not force the user to take a photo using automatic adjustments.

Here we can add the spatial temporal integration, which is done through sensors and the internal clock, so the action takes place in relation with certain place, context and time.

3. Mechatronics operate, design and provide a systemic control. It doesn't get lost in details, but observe the overall systems, with all their essential features and allow them to control efficiently. This control regards those features which allow the change of operating regime, considering the need that the product is built to satisfy. This way the mechatronic products are obtained and thus are adaptable to the needs and also efficiency in their exploitation.

4. It develops products with at least two special characteristics: the presence and the interconnection. These products collect information from the environment with the help of sensors, information which the operating system can take into account. From on/off switch of simple systems, turning on the light, turning on the heat, to recognizing the owner and even its mood, this feature can be ensured only in a dynamic state of the system. There are several processes taking place simultaneously: the sensors scan the environment, some routines verify the state of the collected variables or specific memorized data about the moment of the day etc. This presence is ensured by the fact that a smart machine can operate more important things in the same time, without losing the overall control. It's like a company with a number of employees, where everyone is doing its job.

The interconnectivity is no longer news in the world of Internet of things. I'm not talking about computers here, but about ordinary things. We have smartphones, TVs, printers etc. which update themselves alone with an Internet connection. Thereby, through access to the "family culture" from where they come, they improve their functioning without human intervention.

5. It proposes a sustainable, ecological approach. Mechatronics enables building of some products used in multiple ways which can fully exploit a given hardware complex structure, by integrating the smart functioning. For example, the smartphone integrates in a single gadget many others devices which were once independent. The users of these smartphones or tablets have also inside them a little computer which they use to navigate on the Internet, visualize, create and send documents/ They can take notes, listen to music, watch movies, play different games, etc. The users also have a camera that can take photos, videos or scan documents, a GPS, a flashlight, a compass, a radio FM receiver etc. It's enough to imagine what a luggage a man would have if all these features would have been incorporated in different devices. We can observe how much we can reduce the material and energetic resources consumption or how much the pollution decreases because of this integration. Moreover, with such a smartphone, even if it is older, we can use new apps which can be installed in it.

6. Mechatronics is integrated in all new products, but it's not "proud" of its achievements. On the contrary, it is modest domain which serves all the fields of life. There is no product imprinted "mechatronic product", but if it's intelligent, it is because of the inner mechatronics.

Considering these features, we'll use next the adjective "mechatronic" to assign the products, the achievements, which have the above qualities integrated.

So, we see in mechatronics a lot of integrated and capitalized knowledge. We can use its model to help us in the field of social sciences. Thus, we can obtain a better image of the human being and more adequate steps in supporting the man and the society to exploit, manage and integrate the knowledge.

## **2. Mechatronics and mankind understanding**

The human is a dynamic reality mechatronic system, just like the intelligent product. Compared to products, he is hyper-intelligent, hyper-integrated and autonomous. Inside him and in his social achievements we see a lot of mechanisms from the biological ones to the ones pertaining to the interactions between countries. Humans manage alone the materiality, the energy and the information and, in couple, they can bring to life another human being. That is why the static description about them is incomplete and reductionist. The descriptions from different disciplines are not complete no matter how many specific mechanisms we can find, because we need to see the human as an integrated system to see how the three components are managed (the material, the energy and the information), in order to have a better perspective about him.

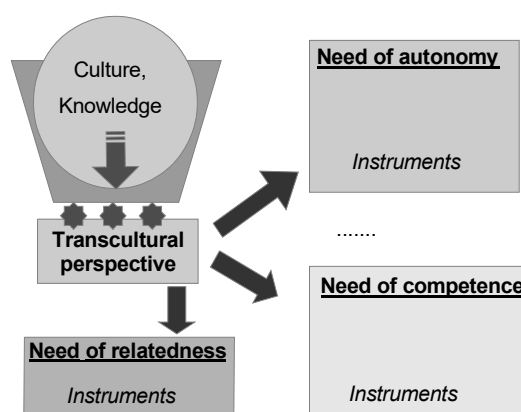
A better understanding from an integrative perspective would allow us to manage the knowledge better and to streamline the effort of supporting him and of optimizing his social interactions. Before this we will make a brief analysis from the mechatronics perspective, without insisting on the aspects already presented by other disciplines. We will take a look over those that are most relevant for the integrative perspective, analyzing the human regarding these three reality domains.

### 2.1. The informational component

First, we observe that the human, as a whole, doesn't memorize or doesn't operate with simple data etc., he is more pragmatic. He observes the reality and absorbs from it, especially from his peers, methods of action which enable him to satisfy his three most important needs: autonomy, competence and relatedness. These working methods are kept in the culture of a family, a group or a country and are transmitted to the children almost with no effort. As an illustration of this approach, there is a popular observation which stipulates that the children are not doing what their parents say, but what their parents do. They ignore the given information and pay attention to the working models because these are relevant to them and they need them.

In other words, we remember things in an integrated manner, like instruments defined by the purpose, the context and the used means. The mirror neurons that help us learn a lot of things don't even activate themselves if we cannot see the purpose of an action or its benefit in satisfying our needs. The integration of knowledge is mechatronic in this case because it has the all three dimensions (context and means – material, the use of the means – informational and the purpose or intention – the energetic dimension). The theories and the collections of information are parts of the context adaptation and action refinements, and not a purpose itself. The purpose is given by the people considering the concrete benefits on the way of satisfying their needs.

A transcultural approach allows overcoming the cultural relativism with its two main sources. The integration of the cultural products can be achieved if we consider that everything the culture has to offer, including the values, can be seen as a collection of instruments whose main goal is to serve satisfying fundamental needs – figure 1. These instruments can be evaluated from above the cultures through the impact the results they produce when they are used. So, the culture is made to serve man and not the other way around [15].



**Figure 1.** Knowledge and culture transformation determined by transcultural perspective.

The better the human manages his own culture (as a mental software), the richer will be in adequate instruments and will also be in a better control of himself. If he keeps only the heritage from his parents, his actions will be almost reflexive in given situations. He is in total control only with what he brings consciously to his development, through the effort of learning the instruments use. Every discipline and every competence domain developed a series of instruments useful to people. So, through the management of our own culture and through influencing the culture in which he works, the human operates in the domain of information he uses.

### 2.2. The energetic component

Without energy any intelligent machine is dead, it can't do anything, no matter how good the software and hardware components are. Only with the help of energy, the dynamic states can be created which

the intelligent machine is adopting and managing. The events which can influence from the outside the machine's functioning regime, are also energetic, except time.

The human is "turned on" when he's awake but he needs impulses and reasons to direct his activity. Human motivation is the one that is responsible for providing energetic support that is necessary to the approaches. Marshall Rosenberg [2,3] demonstrated the importance of human needs and the power of their fulfillments, which can defuse even conflicts between deadly enemies. The non-violent language that he proposes aims to achieve the correct approach for fulfilling the needs of all the parts involved and thus to ensure the peace and a very good collaboration. The emotions, the feelings and the way we feel are determined by the fulfillment or not our needs.

The Self-Determination Theory and recent extended research [4], established that people have three fundamental needs: autonomy, competence and relatedness. For a harmonious evolution, all three needs have to be satisfied. We have pleasant feelings when our needs are fulfilled and unpleasant ones when we have problems in fulfilling them. The emotions are movements of energy, unconsciously mobilized, intended to reward a success and overcome a failure. We need to harness both of them to move in the right direction, because this is what leads us to a better evolution, not running from the negative emotions and looking only for the positive ones.

### *2.3. The matter component*

The intelligent machines load their software and after that they function riding from the external memory support. So, even information needs a material support where the instructions and data are coded.

When we talk about the human, the auto-programming (which is more or less conscious) is also made using a material support. It has 2 major components: 1. Ties between neurons through dendrites and 2. The myelination of the neuronal networks involved [5]. The optimization of these networks is being achieved only in time, if we use them intensively. The layer of myelin, which increases the speed of the nervous influx transmission, needs time to be created. If we use them frequently, the process of myelination is set on. This will highly increase the performance in data processing and the accuracy in the execution of tasks.

Because of this reason, the theoretical learning of these instruments has no major effects in their use. On the contrary, it may determine students to learn a theorizing approach, focused on opinions and self-esteem based on these abilities, instead on facts. But the effective practice in working with the instrument desired to be mastered determines an increase in activity and performance, through the improvement of neuronal networks which help in the instrument use process.

To improve programming and also our answers we have three main instruments of control: the conscious, the unconscious and the consciousness. All the optimization activity is accomplished with a very low participation of the conscious. This has to monitor some variables which lead to a good management of the process, the inner game [6]. The unconscious turned out today to be much more useful than the psychotherapists believed in the past when they consider just a deposit of the wishes or repressed experiences. It is the one that makes the necessary work for the accomplishment of the tasks, it is in charge of the activity optimization, offers answers to us etc. [7]. For example, if riding the bike would have been controlled by the conscious, with its slow speed of processing and with its small bandwidth, we would be more walking near the bike because we would not be even able to maintain our balance. Moreover, it is not capable to "tell" the muscles how, when and how much to work. The unconscious is the one that allows us to admire relax the landscape while riding the bike.

The consciousness is a construction, a very important instrument, which takes care of our participation in relationships and of the compliance to the group rules that ensure our membership. It warns us when our actions may influence negatively the relations or the personal integrity and can lead to our removal from the group. Without it we don't have the mirror of reality from the perspective of interconnection and that is why the absence of a strong knowledge weakens the membership, with all the associated negative effects.

#### 2.4. Integrating the components

All these components don't function independently, but in an integrated manner. We function like a good integrated system, so the best starting point is to find the component that we need to produce the leverage effect. The leverage effect is present in every system and refers to the small changes that influence the entire functioning of the system. For example, the rudder of a ship determines the ship's direction even if it is a lot smaller considering its weight and the dimensions [8].

For a human, this leverage point should be situated at the intersection of the three components that we spoke about, but also at the meeting point of the person with the groups he is part of. We discovered from analyses that this is the competence [9]. It is a need so it ensures energetic support. We can achieve through culture, the informational component and reflects itself in attitude, the material component. It is required in any system which distributes and evaluates the competences, but is also sought by the person who desires a qualitative participation. As a result of a qualitative participation, because of the shown trust, the oxytocin secretion is stimulated (the relationship hormone, which has tremendous positive effects for the body). This substance ensures a good person functioning, at physiological and psychological level [10].

The choice confirmation comes from the cultural levels analyses. The groups of people, from 20 to 150 who know each other [11] can situate themselves, according to their perspective about life, on one of the 5 cultural levels starting from "Life sucks!" (Level 1) to "Life is great!" (Level 5). The attitude comes from the level of mastering the instruments they have to handle life, practically using their competence. Even it seems that we choose our attitude, it is closely correlated with the available instruments that help us successfully cope with the situation [12], so as the unconscious, the one which rapidly evaluates the given situation, has the determinant role of the attitude choice.

On the 2nd level, the topic is "My life sucks!", on the 3rd one – "I am great! (not you)" and on the 4th – "We are great! (not you)". The necessary development for us to successfully respond on every level is hidden in the responsibility term (response + ability). The transition from one level to another or the improvement of competence is achieved by assuming the responsibility for your own results (3). For the results of the groups, you are part of 4<sup>th</sup> level, or 5<sup>th</sup> for those of the society. On the 3rd level, the autonomy increases, on the 4<sup>th</sup> – the group competence and on the 5th – the relatedness up to the integration. Every fulfilled need offers satisfaction and here is where the positive attitude from the last 3 levels has its origins. From an integrated perspective, the main components of mechatronics and competence is presented in table 1.

**Table 1.** Main components of mechatronics and competence.

	<b>Matter</b>	<b>Energy</b>	<b>Information</b>
<b>Mechatronics</b>	Mechanics	Electrical Engineering, electronics	Informatics
<b>Competence</b>	Personal, group control	Fundamental needs	Culture

We can also observe the spiritual component of the competence, the act of serving (ministration). Serving our peers and together with them the people's set of instruments is getting more complex, providing their potential a possibility of manifestation.

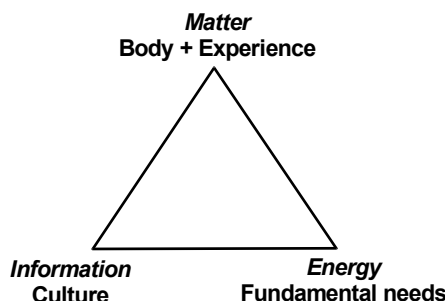
### 3. The organization and integration of education

Looking to the integration of the three components from a careful insight, it is obvious that in most of the countries including ours, the education is not integral (it's not addressed to the whole). As it is organized today, the energetic level and the one regarding the control materialization in the human body are not taken into consideration. Regarding the knowledge integration – the approach is cultural, the emphasis is on the transmission of information and luckily, on the presentation of the available

instruments with little and rare practice. But this is insufficient for the neuronal networks to develop so the instruments cannot be managed themselves. These are only programs in which practice has an important weight, like medicine or technical schools, but we can't guarantee its convergence about the instruments that should be developed.

Even if it says that its target is to develop student's competences, the way they understand it and think that should implement it is poor. The indicator of the competence is the attitude and it's directly related to the available student's instruments. That is why we should focus on the awareness and the usefulness of the instruments that can help them handle the situations.

Today, the student learns especially because he is obligated, to end the educational cycles and to get diplomas. But a good education should lead carefully further the interest of children for learning. This can be achieved by gratifying the fundamental needs. The children follow instinctively the fulfillment of the competence, autonomy and the relatedness needs since they are little. An approach which conforms to the human nature should go further on the same line. The three main parts of integrated education is presented in figure 2.



**Figure 2.** Education must integrate all three main components.

It would be more attractive for students to simulate some real life situations, where they need to use instruments which are used generally by adults or where they may have responsibilities.

### *3.1. The social integration of education*

A real education it's supposed to mean more than just the interaction between the professor and the student. The student is no longer a simple information receiver, but a person who learns how to use instruments. There cannot be arbitrarily proposed, but very well chosen and suitably integrated. The myelination of neurons is an irreversible process, thus gaining some wrong habits may be very difficult to change. It is necessary for the instruments to be chosen by the economic and social fields, in collaboration with the professors so that they would be well selected. This way, the education will integrate in the society because of the attention and the support given to the fulfillment of the individual's and society's needs. After ending the studies, the students should be integrated well on the labor market, without special efforts. This can be achieved only if the labor market is involved in education, if they describe clearly what they need and also propose activities and competitions from where they see what instruments are needed for those who want to conduct activities in different domains or for some types of employers.

The complex instruments claim simpler tools thus from the needs we can move with the analyses and selection of the instruments up to the identification of those that the children from the primary school have to master. Such a hierarchical structure can be built very well defined where every stair and every specialization have clearly specified the necessary instruments. For example it's good to be clear which are the necessary instruments to continue the studies by learning how to use other instruments according to the specialization. It's the same when we talk about superior studies. A person cannot continue a qualitative socio-professional evolution without having a portfolio with good mastered instruments. This is the role of the skills portfolio mentioned in the education law.



All the respectable companies have a list with the necessary skills for every job. These may become accessible, transparent for the students so as they can prepare themselves to successfully handle specific tasks of the public or private employers. Otherwise, they develop through mastering of some instruments that the business and social environment will require.

To avoid confusions, I'd like to specify again that through the "instrument" term we understand both the concrete, material instruments (as an intelligent machine or machinery) and the mental instruments used in different fields like: the integral calculus, the use of some dedicated software applications, the expression through different types of texts (scientific, literary), assertive communication, non-violent communication, systemic, integrative way of thinking, phenomenological analyses, working as a team etc.

This type of integration is not about serving the education of socio-economic environment, but about integrating its needs too. It's not only for the good wealth of the society but also to offer real chances to the graduates, related to their possibilities. To be really humane in the family and at the workplace, no matter which is it, we all need to master some universal instruments that allows us to know ourselves and how auto-programming determines our life. Moreover, we can observe how really efficient teams are built, what an authentic leadership means, how to learn from history etc. These types of instruments which are necessary to a good self-management and to a proper participation in the group's life and to the social one are also proposed to the students from high school. They are necessary, no matter who the employer is and they are much more important if the student wants to be an entrepreneur. I want to mention that the vocational education is not disappearing because it needs its instruments, too.

### *3.2. The integration of professor-students activity*

Today, the two parties meet each other at classes, seminars, courses and then at the exam. Different kinds of knowledge are transmitted, more or less integrated and their reproduction is required to prove the competence. But as I mentioned before, the approach is not a natural one, not even truly socio-constructivist. The teachers choose very precisely what needs to be studied and the students need to conform unconditionally. Unfortunately, this conformance is often part of the grade.

Therefore, the student's need of autonomy is not satisfied at all. It is desirable that the student to choose the instruments he wants to study and the transition to a superior level of study, giving a certain specialization, to be conditioned by the good mastering of the set of instruments. This way, the autonomy of the students would be respected and the responsibility of development would be transferred on its beneficiary: the student. The professors will become what they are supposed to be, a kind, qualified supporter offered to students for their accomplishment. The oppressing character of schooling would disappear and things would become normal in education. The only thing that should be considered is the portfolio with instruments which is targeting their competence. No one would operate any more with useless fields in student's development, those that destroy the qualitative information and transforms it in irrelevant quantities. This is how things happen in the elementary school. It is to be mentioned that the certificate issued at the end of the studies it's a document that fits well in this description. Its generalization would be very useful on all stages of development, because of the good reflection of the student's preparation in managing the instruments.

The new proposed phenomena, the one that lets the student to choose its route, involve the possibility of choosing from something well defined. In the classical approach, the child doesn't know what he is going to learn if he can't have a look in the textbook. But it's not sure even if he does this because the teacher can change the order of the lessons if he wants to. In the approach where the energetic component of the person (the one that requires autonomy) is being considered, the student can see how the things that are proposed him can be used in the future and he can now successfully take some responsibilities and see some kind of a construction or map of instruments, where every move makes sense.

In order to reach this thing, to make and maintain a good evidence of student's development, we need a new instrument, an online platform where he and the teachers can better collaborate.

#### **4. The integrative platform of mechatronic type**

Beside a better vision of the human being and pertinent ideas to optimize the educational system, according to human nature and common life, the technology and especially mechatronics can provide a concrete support to help the education. This support is a platform made to facilitate a good integration of education in society and the educational efforts of the teachers and students.

##### *4.1. Online websites for the improvement of competence*

The online websites are instruments which may be useful in the educational process. Beside the fact that a proper construction using them can offer a clearer image of the instruments that the education proposes on different pathways, the link between them and their purpose, they also can offer useful materials to master them easier. Having the possibility to access the platform, the student is more implicated in his development than he is in the classroom.

There are at least a few advantages of working with the platform, which have to be taken into account.

First of all, with its help we can develop a natural approach of learning where the use of an instrument can be trained by simulating or taking part in adequate exercises. The task proposed to the child can be similar to those from reality and so there will appear adequate nerve connections and the nervous circuits, which are used in normal conditions, will myelinate. The computer doesn't hurry: he has patience, so a section can be crossed even 100 times and the student can insist on the problematic points till they get solved.

In the actual context, a professor needs to handle a big number of students so that's the only way to individualize learning. This is necessary because the students have different paces of learning, different interests and abilities. No matter which is it, the pace, the materials and the level of difficulty are all chosen by the student, according to his options.

With the help of the website we can obtain a more efficient interaction between teachers and students. All that the student is doing is being registered and the teacher can see exactly where the student has problems and she can help him. Good information about the situation of the student development is a mandatory condition to give him the help that he needs.

On the website, one can achieve an integrated and adaptive training. The time loss can be avoided and also a solid structure of the development can be built by monitoring the premises that are needed to approach a certain working material. The adaptability means offering the student materials according to its possibilities. So, if the student has big difficulties, the website proposes him the cancellation of the current activity to a less difficult one in the hierarchy of instruments. If the current tasks are too easy, the website proposes difficult ones, so the student is always in the right area of his development.

Another aspect at least as important as the previous one is that the website facilitates the responsibility assumption of the student. He can no longer blame the professor for not teaching right, for not giving him the necessary attention or other unfavorable circumstances because the site is always available and the student can use it how and as long as he wants. The qualified help of the professor can serve all students in the same time, without any problems.

The successful achievement of all the sites is possible only if the site is mechatronic, meaning integrated, with a good management of all the three components.

##### *4.2. Concrete solutions*

In this sense, two websites were created by the Alba County Scholar Inspectorate within the context of two projects, one of them strategically, lasting 3 years, and the other one was smaller, lasting only 5 months. Their aim was to improve competence. Within the first project, taken place between 2011 and 2013, we created a website reachable at [www.miculprint.eu](http://www.miculprint.eu), created from scratch, in accordance with an own CMS (Competency Management System) concept which targeted the proper management of the three major components. Through these platforms we settled student recovery activities for Romanian language and Mathematics disciplines. Firstly, the necessary skills, the general and specific

ones, for the two disciplines were reworded and integrated. Even if we didn't use this term in that context, they were regarded as instruments. To deepen the use of instruments, we used materials that were organized on 4 levels of abstraction, starting from presenting his utility to the identification of the instruments utility beyond the discipline, in a large context.

In this project 1096 students were involved during the period of 6 months who worked on the site 3 days a week, 3 hours a day, of which half an hour was lunch, after school program. Through a good and organized approach of initial evaluation, we were able to detect their gaps early and to propose a plan of recovery to take into consideration these problems. The interest of the children was extraordinary and the results exceeded the expectations [13,14]. These results are due to the new approach, the one with respect for the children and in the integrative spirit of mechatronics.

The second project was conducted in 2015 and the site can be found at the address [www.viataeminunata.ro](http://www.viataeminunata.ro) (life is wonderful). The aim of the project was to make a competition on "Why, how and what I learn?" in which were involved 15.000 students. The purpose was to bring the children on the 5th level of culture, where life is great, that is why we chose this web domain name. In the project we adopted a LMS (Learning Management System), Ilias, so it could allow us to do specific activities – competition, structures of instruments, qualitative reflection of results, adaptability etc.

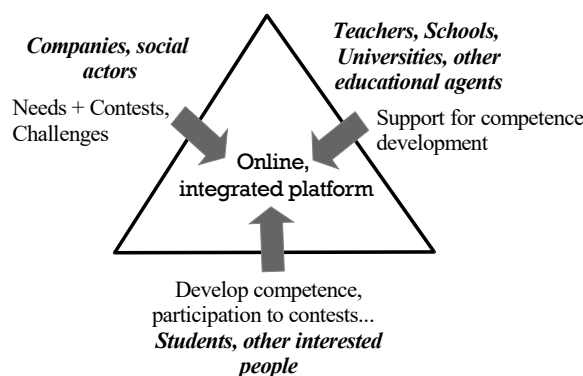
The materials, both for training and evaluation were made on 5 levels according to the 5 cultural levels, only for the description of the instruments on all of the 8 competency domains (1 to 8 classes). On the first level we tried to show how the world would be without a certain instrument, on the 2nd one we let them recognize the people who know how to use that instrument and which are their benefits, on the 3rd level - what would involve mastering the instrument, on 4th – how can we use it in a group and on the 5th – which is its role at social level and how can we use it in other domains.

Those who achieved a minimum of 100 points received contest participation certificates. For the 1 to 3rd prizes we considered personal works and the points gained in the evaluation activities.

Both projects showed not only the interest of children in using these instruments but also their diligence if they have the instrument. For example, in the first project, the average number of answers per hour was 32, this score can only be achieved at classes in a long period of time - a semester or even a year if the classes are reduced.

#### 4.3. The mechatronic platform for integrative education

The online platforms are used to offer support for an integrative education. They take into consideration the three major components which must be integrated to have a qualitative instrument. In terms of information, they propose the improvement of competence by managing the instruments, they permit an autonomous approach and a vision about what should be ideal to master and it stimulates the mobilization of student's energy this way, through the originality of the approach. They also can provide a concrete support, well structured, to make a support for the desired student's development. In figure 3 is represented the main participants and their activities.



**Figure 3** Integration of education in society using online platforms.

With the help of the implemented “sensors” teachers can adapt the contents to the needs of the student.

The most difficult requirements that need to be accomplished to overcome the cultural relativity are specific to different economic agents or to different providers of education and are overcome through the suggested transcultural language. The suggested approach is related with the human nature. It targets and maintains the focus on the competency, so this leads to an efficient development at the physiological level.

The participation of the social and economic environments it's easy to implement by using instruments for collaboration on the websites or even through suggestions of activities for the students. Their involvement is being fulfilled through common activities with educational state organizations from the elementary to the superior levels.

## 5. Conclusions

To achieve an integrative education based on the integrative philosophy of mechatronics is probably the best approach to successfully overcome the big challenge brought by the society of knowledge. The careful managing of the three major components of reality – material, energetic and informational – ensures an efficient and natural approach.

Within this approach, systemically observed and organized, the human considers and acts on the most powerful development level. This has the power to integrate not only the human in groups, but the human into himself and the groups in society, etc. By looking for this it's being ensured the integration and the complexification of the participants in the common approach.

This activity ensures a harmonious development of the people and a release from the impersonal pressure of an increasing knowledge. The integral education, the adopted approach, offers them the power to master, manage and integrate the knowledge, so the final beneficiary is the human being.

Without this kind of education, without conjugating the efforts with other people, the man would continue to be helpless in relation with the culture and he will not reach his goal for which even the knowledge is produced – his own happiness. In the academic world seems an honor to serve knowledge. But if knowledge is not well managed it transforms those who create, disseminate and harness it into slaves. The proposed perspective is transcultural and it has the power to integrate and manage knowledge. So the man's entrance in the era of knowledge will be a success.

The use of mechatronics on the fifth cultural level offers two important things: a transcultural and integrative perspective and a technological support for increasing social integration through the online platforms. Both instruments are based on competence, as fundamental need, and are very important for the development of the knowledge society

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