

# Essentials of the e-TMA System for the Arab Open University

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## Abstract

The Arab Open University (AOU) uses two forms of student performance assessment in its pedagogical model. These forms are *summative assessment* and *formative assessment*. The former uses electronic and written tests for quizzes and final exams; while the latter form of assessment uses Tutor-Marker Assignments (TMA) as a continuous assessment cycle of forming a solution to real-world problems, assessing the solution, and then improving the solution for further rounds of improvement and re-assessment. These TMAs are graded by the tutor during the semester and then returned to the students with informative feedback to improve the students' performance in future TMA submissions. The quality of this feedback is normally monitored by senior staff member (staff tutor) who in turn gives feedback to the tutor in an attempt to improve the quality of the formative assessment processes. The large number of TMA submissions and the involved TMA handling process adds tremendous amount of work on the tutors and the staff tutors. Derived by the significant contribution of correct TMA handling to the success of open learning models; we present in this paper the fundamental aspects of an electronic TMA (e-TMA) system as applied to the Arab Open University. The proposed e-TMA system is meant to regulate grading, monitoring, achieving, and maintain a complete record for quality assurance purposes. The AOU has already committed itself through its branch in Jordan to realizing the e-TMA in the context of a joint project<sup>1</sup> funded by the European Commission.

**Keywords:** e-learning, virtual learning, open and distance education, and e-TMA.

## 1 Introduction

The need for an electronic system for handling tutor-marked assignments stems from the significance of this assessment part to the success of open learning. Adding to it the tremendous amount of “mechanical” work associated with archiving, grading, monitoring, and quality assurance procedures for the TMA submissions; the urgency of such system becomes quite apparent. Before presenting the details of the desired e-TMA system, it might be useful to give a brief idea of the AOU's Integrated Learning Environment (AOUILE) and its online delivery modes.

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<sup>1</sup> JEP31004-2003, “Open Learning Modules and Technologies”, an EC funded project jointly implemented with AOU, JU, and PSUT - Jordan, AU – Spain, IDEC - Greece, ORT – France, AIESEC – The Netherlands, and PLOCDIV – Bulgaria.

The AOU is now using a number of sub-systems that can be seen as elements of the AOUILE. In what follows we briefly describe each of these elements and we also discuss the function of each element within the AOUILE.

FirstClass<sup>2</sup> is the computer-mediated-communication tool (CMC) presently in use by the AOU for online course support. The tool contributes to the learning process in a number of ways. First, it is used to setup online conferences where student and tutor groups share virtual spaces for course related discussions and sharing materials. Second, it offers email, chat, quick poll, news groups, and calendar management services. Third, even though it has some deficiencies as will be discussed next, FirstClass is the only available service for TMA handling.

FirstClass services are constructed once at the beginning of each semester through batch files generated by the AOU's Student Information System (AOUSIS) and then emailed to the UKOU support team for batch feed to the FirstClass account generation utilities. This process is rather lengthy and manual in most of it. Furthermore, the TMA support is done through customized FirstClass conferencing, which puts a number of limitations related to submission and archiving, inadequate quality assurance support, and the lack of cross-check facilities.

At the content level, the AOU has a number of online courses being licensed by the OUKOU. These online courses are "partially" integrated with the other elements of the AOUILE in the sense that granting access is also achieved through batch processing as in the case of FirstClass access. The offered online courses have a certain level of integration with the CMC services.

Some of the current online courses that are presented at the AOU are purely online with no printed materials except the welcome letters and course guides; while other courses refer heavily to offline resources such as printed materials, video tapes, compact disks, etc. The AOU is currently developing a number of new online courses that could potentially benefit from all elements of a functional AOUILE.

For summative assessment part, the AOU is utilizing a combination of in-house and third-party applications for online testing (e-Testing). These applications can be easily integrated with the AOUILE. The types of tests that are conducted using the e-Testing system include quizzes and final tests as well as the language proficiency tests.

One of the missing parts of the AOUILE is an LMS, and particularly the e-TMA, that can combine all of these parts into AOUILE. The AOU has considered a number of options for the LMS including off-the-shelf products and free open source software (FOSS) alternatives. The e-Learning committee at the AOU has finally concluded its work and recommended the use of FOSS; particularly Moodle<sup>3</sup> as a viable alternative for starting the AOUILE project.

The AOU's approach in developing its AOUILE consists of three phases: The first phase undertakes the necessary measures to realize an appropriate learning management system using the existing wealth of FOSS. The second phase requires an LMS as a prerequisite plus a number of elements to be integrated into the AOUILE. At this stage the LMS should be interfaced with the AOUSIS; and then with the online course modules, the existing CMC

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<sup>2</sup> [www.firstclass.com](http://www.firstclass.com)

<sup>3</sup> [www.moodle.org](http://www.moodle.org)

setup, the e-Testing element, the e-TMA system as well as other working elements of the online course delivery system. The result of this phase is what we call as Integrated Learning Environment (ILE).

The last phase will incorporate existing online courses into the ILE. This phase will contain course-specific programming and migration of existing course related applications. This phase is a long term cycle that will require joint efforts from AOUILE developers and course designers to transfer existing courses and also to develop new ones.

In this paper we will focus on the e-TMA as an essential ingredient of the AOUILE. The rest of the paper is organized as follows: In the next section we will outline the formative assessment element (TMAs) in the AOU. Section 3 gives a glimpse on the targeted e-TMA system and discusses a proposed method for realizing it. Conclusions are given in the last section.

## **2 Tutor Marked Assignments in the AOU**

TMAs use project-based learning approaches to present students with real-world questions or problems for investigation related to one or more of the course modules. Project-based learning focuses on teaching by engaging students in a learning community. Within this framework, students pursue solutions to nontrivial problems by asking and refining questions, debating ideas, making predictions, designing plans and experiments, collecting and analyzing data, drawing conclusions, communicating their ideas and findings to others, asking new questions, and creating artifacts.

Each TMA is also results-based and culminate in students (individually or in teams) creating learning products. The questions or problems for investigation form the foundation of the TMAs that students will carry out individually or in teams. The TMA system includes opportunities for tutors and students to define their own questions and create their own learning materials that reflect the reality of the local community. Students work alone or in teams to investigate these problems, discover information and combine this in new ways to create practical solutions. Students will then organized their results into learning products such as demonstrations, presentations, reports, spreadsheets, diagrams, databases, websites, and so on, that will eventually comprise the students' portfolio of achievement. The learning of many basic computer skills such as spreadsheets, presentations and word processing, programming, accounting, and other software are reinforced by carrying out the TMAs. Students are encouraged to seek help from fellow students, tutors and community members in carrying out their TMAs.

Completed TMAs are assessed by tutors and through formal metrics developed by the course team. Tutors are assigned groups of 25 to 30 students. The number of TMAs in each course depends on the credit hours in that course.

TMA handling process include three major tasks, these are: grading, monitoring, and achieving. Below we give a detailed procedure on how TMAs are handled in the AOU context.

**GRADING:**

Step 1: The students retrieve the TMA questions from the course website.

Step 2: The students moderate among themselves to form working groups using FirstClass as a main communication and moderation medium.

Step 3: Once the TMA solution is ready, each student submits his/her solution to an address specific to his/her tutor group. Here we refer by *TMA script* to the student solution for the TMA.

Step 4: The tutors receive and then grade the submitted TMAs using pre-set grading guidelines and marking schemes in order to ensure consistent grading across different groups. The tutors send their feedback and grades to each of the students' addresses using email. Here we refer by *PT3 form* to the tutor grade and feedback report to each TMA script.

**MONITORING:**

Step 4: A senior staff (staff tutor) in the course selects a set of TMA scripts and their corresponding PT3 forms, refer to by *TMA-PT3 pairs*, with the tutor allotted grade *sealed* from each group. The number of such pairs in the selected sets depends on the tutor's *monitoring level* for the group. This number is determined as follow:

*Monitoring level A:* This is for the most experienced tutors where one pair from every other group is selected.

*Monitoring level B:* One pair from each group is selected.

*Monitoring level C:* Three pairs from each group are selected.

*Monitoring level D:* Six pairs from each group are selected.

Step 5: The staff tutor anonymously sends the items in the selected sets to other tutors for cross grading. The tutor names are sealed to ensure anonymity in the monitoring process. We refer to the process in this and the previous steps by *dispatching the TMA-PT3 pairs*.

Step 6: Upon receiving the anonymous TMA-PT3 pairs, the tutors grade the TMAs using the same guidelines and return them to the staff tutor.

Step 7: Once all tutors return the regarded TMA-PT3 pairs, the staff tutor fills one *monitoring form* for each group. This form has the format shown in Figure 1. The tutor and the monitor names are filled on the top row. Names of students for whom the TMA-PT3 pair being monitored are also filled along with the tutor and the monitor grades. Of course in our targeted e-TMA system all these filed should be filled automatically by the system. The rest of the fields will either be filled manually by the staff tutor or semi-automatically by the system.

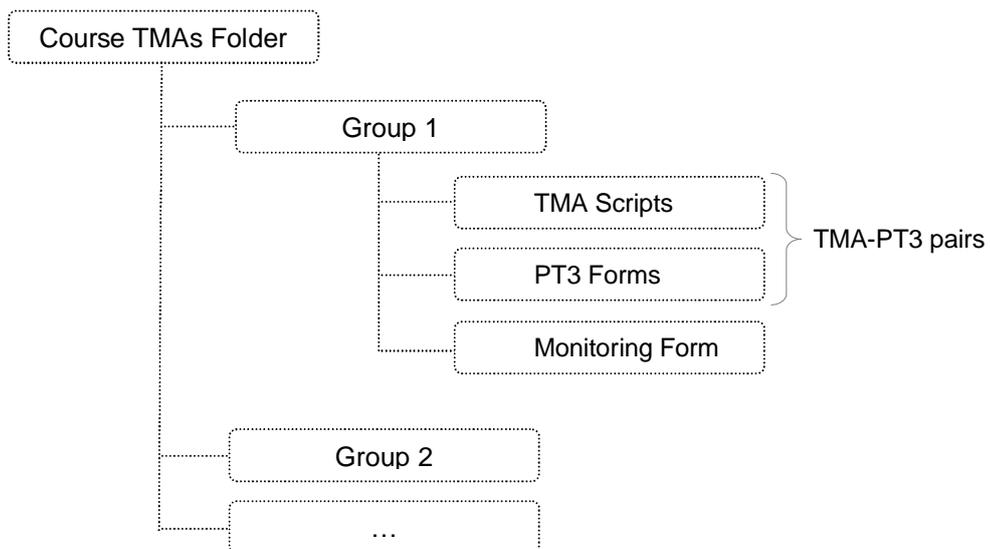
**ARCHIVING:**

Step 8: The staff tutor finally generates folders for each course containing the monitored TMAs and the monitoring forms which are stored for quality assurance purposes. The course folder contains information as shown in Figure 2. Again the our targeted e-TMA system will automatically take care of this archiving process as will be explained in the sequel.

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Tutor name:		Monitor Name:			
Present monitoring level		A	B	C	D
Lenient		Satisfactory		Sever	
Student name	Grade		Comments on the PT3 form		
	Tutor	Monitor	Satisfactory	Unsatisfactory	
Correcting factual errors			Explaining awarded grades adequately		
Reference to course materials			Suggesting ways of improving future TMAs		
Comments structure/arguments			Exhibiting helpful attitude/tone		
Noting and explaining irrelevance			Making clear constructive comments		
Further comments					
Staff tutor name					
Staff tutor comments					
Future monitoring level	A	B	C	Tick here if there are issues for discussion	

**Figure 1:** TMA standard monitoring form.



**Figure 2:** Archived course TMAs folder

The full TMA archive should necessarily contain one folder (course TMAs folder) for each course. In the AOU context this information plays an instrumental role in the quality assurance processes. Currently, these folders are generated manually in their entirety. As the reader can estimate, the amount of work required to generate these folders is rather prohibitive. Hence, the AOU paid a lot of attention towards automating this large amount of mechanical work.

### 3 Realizing an e-TMA System

As we have mentioned earlier, the AOU decided to use Moodle as one of the popular FOSS learning management systems in its online educational delivery. Moodle supports a module called *Assignment* which has most of the needed functionality for the targeted e-TMA system. The current Assignment module supports submission, deadline enforcement, grading and feedback templates as well as automatic notification tool. The missing functionality is related to *monitoring* and *archiving* as described in the previous section.

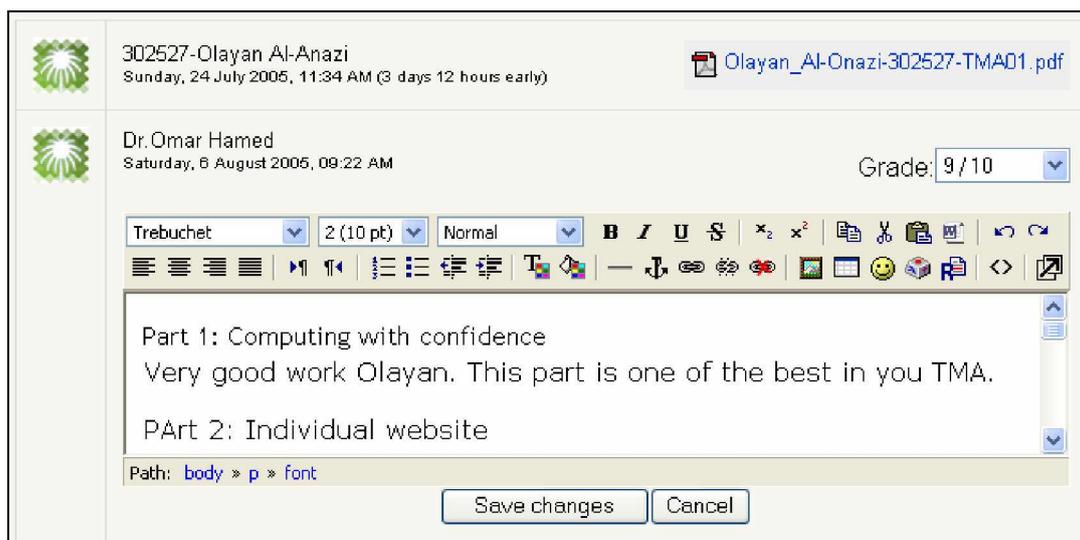
Before we discuss how the current Assignment module of Moodle can be modified to serve monitoring and archiving, we will first present the existing functionalities to give a full picture of the desired e-TMA system.

Once added to a course, the Assignment module allows the students to upload files to the course area where the tutor will be notified each time a student submits a TMA. On a mouse click the tutor will be transferred to the area where he/she can view the submitted TMA and fill out an automatic PT3 form. Figure 3 shows the list of submitted TMAs in all groups of the course TU170 as it currently works in the Assignment module of Moodle.

First name / Surname	Grade	Comment	Last modified (Tutor)	Status
310800-reshed ban rokan	9 / 10	MARKING TEMPLATE ...	Saturday, 30 July 2005, 03:03 AM	Update ...
400636-mamdouh Al-Aswad	6 / 10	MARKING TEMPLATE ...	Sunday, 31 July 2005, 04:18 PM	Update ...
402195-SALMAN Al-Wadany	7 / 10	MARKING TEMPLATE ...	Saturday, 30 July 2005, 03:06 AM	Update ...
402160-saleh Al-Howaitan	8 / 10	MARKING TEMPLATE ...	Saturday, 6 August 2005, 09:24 AM	Update ...
300491-Abdullah Al-Onzi	4 / 10	MARKING TEMPLATE ...	Sunday, 31 July 2005, 04:20 PM	Update ...

Figure 3: Submitted and graded TMAs.

The tutor may choose to grade any TMA by clicking on the *Grade / Update* button in order fill the PT3 form and give the grade. Figure 4 shows the PT3 form filled by the tutor Omar for the student Olayan. Once the tutor clicks on *Save changes*, the PT3 form will be saved in a place visible only to the student, the tutor, and the staff tutor. The student will then be notified with a link to view the PT3 form.



**Figure 4:** PT3 form for one of the submitted and graded TMAs.

At this point Moodle's Assignment module provides raw monitoring, i.e. the staff tutor has to visit all groups and manually select and download the TMA scripts and PT3 forms for monitoring purposes. The staff tutor has to distribute TMA-PT3 pairs to the monitors using email and wait for replies in order to fill the monitoring forms. Once again, the staff tutor has to do some mechanical work to send the TMA-PT3 pairs and fill the monitoring forms.

We should notice here that there are 4 different types of user accounts in Moodle (student, tutor, course creator, and administrator). The tutor account (teacher account in Moodle terminology) allows the tutor to access group activities such as TMA grading. Some tutor accounts are allowed to edit the course activities and hence we call these accounts *staff tutor accounts*. These accounts enable the staff tutors to edit all groups' activities and most importantly the TMAs in all groups.

In order to facilitate monitoring capabilities in the Assignment module of Moodle, we propose to add one more attribute to the tutor account: the *monitoring level*. This attribute will be used later on as a trigger for automatic dispatching of TMA-PT3 pairs. Figure 5 below shows how this attributed is defined.

ADULMS » Courses » TU170 » Assign teachers

Name	Order	Role	Monitoring level	Staff tutor?
 Jedad Sadi	1	Staff tutor	A	Yes <a href="#">Remove teacher</a>
 Enas Ghandour	2	Tutor	C	No <a href="#">Remove teacher</a>
 Alia Baddad	3	Tutor	D	No <a href="#">Remove teacher</a>

**Figure 5:** Defining the monitoring level for tutors.

In the proposed extension for Moodle’s Assignment module (the proposed e-TMA system), the monitoring starts by dispatching the TMA-PT3 pairs. The dispatching routine starts automatically in a certain group once the tutor of that group grades a number of TMAs greater than or equal to his/her monitoring level (see Step 4 in the previous section). If for any reason the dispatching did not start (e.g. lack of graded TMAs), the staff tutor can trigger the dispatching process with whatever TMA-PT3 pairs available by clicking on the button *Start monitoring* as shown in Figure 6. In this figure (which is a modified version of what the current Assignment module in Moodle displays) the status column indicates whether the TMA-PT3 pairs dispatching took place automatically (the groups marked with *TMA-PT3 pairs dispatched*), the dispatching did not yet happen (the groups marked with the button *Start dispatching* which should “enforce” the dispatching routine), or dispatching took place and the tutors to whom the MA-PT3 pairs were dispatched have indeed finished the monitoring (the groups marked with the link *Completed* which should necessarily point to the completed monitoring form).

Figure 5 and Figure 6 overview the modifications needed to be done to the Assignment module of Moodle to enhance it with monitoring and archiving capabilities. In the remaining part of this section we make a closer look on how the module will function to complete the picture of our targeted e-TMA system.

AOULMS » TU170 » Assignments » Monitoring				
Name	Group	Due date	Submitted	Status
TMA01		27 July 2005		
	42001		25	TMA - PT3 pairs dispatched
	42002		25	Completed
	43011		20	Completed
TMA02		20 August 2005		
	42001		21	<input type="button" value="Start monitoring"/>
	42002		18	TMA - PT3 pairs dispatched
	43011		15	<input type="button" value="Start monitoring"/>

**Figure 6:** Triggering the monitoring procedure in the modified Assignment module.

After dispatching TMA-PT3 pairs, the tutors will be notified regularly whenever the dispatching routine selects a tutor for the monitoring a set of TMA-PT3 pairs. The monitor (a tutor) can then see the set of pairs assigned to him/her for monitoring once he/she clicks on the *Assignment* link in the *Activities* block. What the monitor will see is depicted in Figure 7.

AOULMS » TU170 » Assignments			
Name	Due date	Submitted	Waiting to be monitored
TMA01	27 July 2005	25	6
TMA02	20 August 2005	20	5

**Figure 7:** The new content of the tutor's assignments page.

The monitor then should be able to retrieve the TMA script and part of the PT3 prepared by the tutor (recall that the tutor grade should be sealed) for each TMA-PT3 pair sent to him/her for mentoring. In Figure 7, the number of TMA-PT3 pairs assigned to a monitor should be displayed under the field *Waiting to be monitored*. Figure 8 shows what will be displayed for the monitor when he/she clicks on this number. The rows marked with the button *Update* are those which have already been monitored.

AOULMS » TU170 » Assignments » TMA01 » Monitoring		
<input type="checkbox"/>	First name / Surname <input type="checkbox"/>	Status <input type="checkbox"/>
	Rakan Al-Mannai	Monitor ...
	Mamdouh Al-Aswad	Monitor ...
	Rihab Dwairi	Update ...
	Saleh Al-Howaitan	Monitor ...
	Abdullah Al-Onzi	Update ...

**Figure 8:** List of (TMA script, PT3 form) pair ready for monitoring .

Upon clicking on the button *Monitor* a simple form appears (say *regarding form*) on which the monitor will fill the basic monitoring information. This form should contain the following essential fields:

Lenient	<input type="checkbox"/>	Satisfactory	<input type="checkbox"/>	Sever	<input type="checkbox"/>	Inconsistent	<input type="checkbox"/>
Student name	Monitor grade		Comments on the PT3 form				
<input type="text"/>							
Correcting factual errors			<input type="checkbox"/>	Explaining awarded grades adequately			<input type="checkbox"/>
Reference to course materials			<input type="checkbox"/>	Suggesting ways of improving future TMAs			<input type="checkbox"/>
Comments structure/arguments			<input type="checkbox"/>	Exhibiting helpful attitude/tone			<input type="checkbox"/>
Noting and explaining irrelevance			<input type="checkbox"/>	Making clear constructive comments			<input type="checkbox"/>
Further comments			<input type="text"/>				

**Figure 9:** The regarding form.

The regarding form represents the monitor's contribution to the overall monitoring form. The resulting monitoring form after this round will look like Figure 10. The fields *Monitor name*, *students' names*, and the *grades* given by the monitor are filled automatically by the e-TMA system (the modified Assignment module). The remaining fields are filled manually by the monitor and then stored in the underlying database.

Tutor name		Monitor Name	Enas Ehgandour	
Student name	Grade		Comments on the PT3 form	
	Tutor	Monitor	Satisfactory	Unsatisfactory
Rakan Mannai		85	X	
Rehab Dwariri		68	X	
Abdullah Onzi		70		X
Correcting factual errors			Explaining awarded grades adequately	
Reference to course materials			Suggesting ways of improving future TMA's	
Comments structure/arguments			Exhibiting helpful attitude/tone	
Noting and explaining irrelevances			Making clear constructive comments	
Tick here if there are issues for discussion				
Further comments				

**Figure 10:** The monitoring form as displayed for the monitor after monitoring the TMA's.

The monitoring form when viewed by the staff tutor will display both grades given by the tutor and the monitor, and of course the tutor name as well as the fields supplied by the monitor in the regarding form. The monitoring form will be final once the staff tutor manually fills the remaining fields.

Through a staff tutor account we should be able to view the filled monitoring forms in their various states and for any group. The monitoring form can be obtained by clicking on the designator *Completed* under the status column in Figure 6.

The monitoring form in its final status should look like Figure 11. The hyperlinked text should point to other forms and pages where extra information can be found. Links under the names of the tutor, the monitor, and the staff tutor should point to their profiles; while the links under the students' names should point to the submitted TMA script. The PT3 forms developed by the tutor and monitor should be obtained by clicking on their grades respectively.

The form in Figure 11 is a convenient entry point for the staff tutor and all other quality assurance personnel to perform their tasks easily. The form acts as an archiving tool that simulates the archived course TMA's folder as depicted in Figure 2. This form will alleviate the burden on the staff tutors as well as the tutors and the monitors. No need to generate the various CDs for the numerous courses at the end of each semester and academic year. The modified Assignment module of Moodle will provide an easy way to access the courses' TMA's folders from anywhere using a staff tutor account.

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Tutor Name	<a href="#">Ahmed Errais</a>		Monitor Name	<a href="#">Enas Ghandour</a>
Present monitoring level	B			
Grading	Lenient			
Student name	Tutor grade	Monitor grade	Comments on the PT3	
<a href="#">Rakan Mannai</a>	<a href="#">90</a>	<a href="#">85</a>	Satisfactory	
<a href="#">Rehab Dwariri</a>	<a href="#">75</a>	<a href="#">68</a>	Satisfactory	
<a href="#">Abdullah Onzi</a>	<a href="#">85</a>	<a href="#">70</a>	Unsatisfactory	
Correcting factual errors	<input type="checkbox"/>	Explaining awarded grades adequately	<input type="checkbox"/>	
Reference to course materials	<input checked="" type="checkbox"/>	Suggesting ways of improving TMAs	<input type="checkbox"/>	
Comments structure/arguments	<input type="checkbox"/>	Exhibiting helpful attitude/tone	<input type="checkbox"/>	
Noting and explaining irrelevance	<input type="checkbox"/>	Making clear constructive comments	<input checked="" type="checkbox"/>	
Tick here if there are issues for discussion				<input checked="" type="checkbox"/>
Further comments	Grading is consistent except for one of the cases where the grade is over allotted.			
Staff tutor Name	<a href="#">Dr. David Smith</a>			
Staff tutor comments	The difference in the grades is some how concerning and hence I decided to downgrade the monitoring level for this tutor.			
Future monitoring level	C			

**Figure 11:** Completed monitoring form.

## 4 Conclusion

The Assignment module in Moodle serves most of the desired functionalities in an e-TMA system; except for monitoring and archiving. In this paper we outlined the three main tasks related to handling TMAs (assignments) in the AOU educational model. We then explained how the Assignment module in Moodle can be extended to include monitoring and archiving functionalities. In collaboration with other five partners, the AOU embarked on this extension in a framework of joint project<sup>4</sup>. One of the partners from Greece<sup>5</sup> will lead the development team for this extension as one of the main outcomes of the project.

<sup>4</sup> JEP31004-2003, "Open Learning Modules and Technologies", an EC funded project jointly implemented with AOU, JU, and PSUT – Jordan, AU – Spain, IDEC - Greece, ORT – France, AIESEC – The Netherlands, and PLOCDIV – Bulgaria.

<sup>5</sup> [www.idec.gr](http://www.idec.gr)